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POWER UNIT PE-99-B

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POWER UNIT PE-99-B

War Department,

15 December, 1943

POWER UNIT PE-99-B

WAR DEPARTMENT
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DESTRUCTION NOTICE

WHY—To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW—1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools, etc.

2. Cut—Use axes, handaxes, machetes, etc.

3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades, etc.

4. Explosives—Use firearms, grenades, TNT, etc.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

6. USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—1. Smash—Generator and exciter frames, instruments on front and rear of control panel, cylinder heads and cylinder blocks, manifolds, batteries, crankcase, carburetor, magneto, starting motor, charging generator, air filter, fuel tank, muffler.

2. Cut—Remote control and power cables, ignition wires, battery cables, exhaust tubing, remote fuel line, field and armature windings.

3. Bend and/or break—Unit housing, base and control panel and housing.

4. Burn—All wires, cables, manuals and other combustible material.

5. Bury or scatter—Any or all of the above pieces after breaking.

DESTROY EVERYTHING

SAFETY NOTICE

Operation of this equipment involves the use of dangerous voltages. Observe all precautions and safety regulations. If this power unit is operated within a building, make certain that all exhaust connections are gas tight and that the room is properly ventilated.

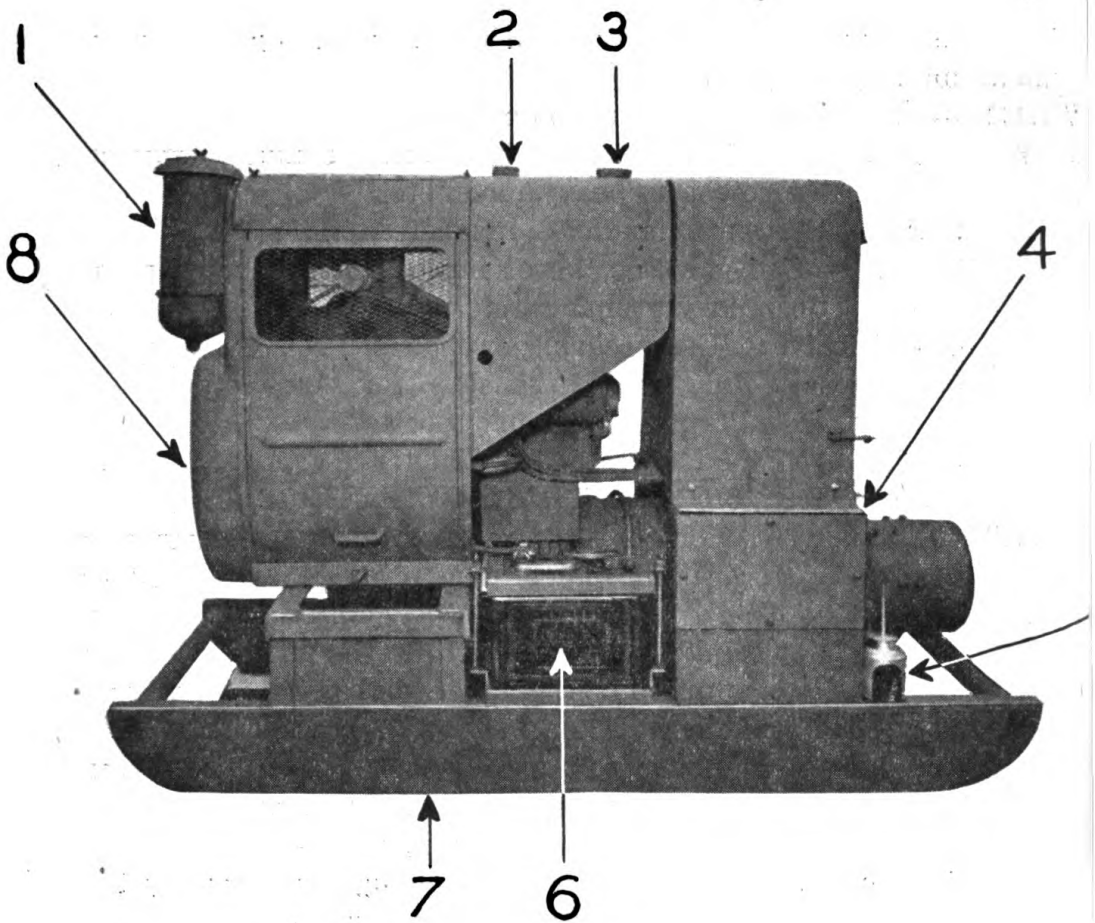
Carbon monoxide, contained in exhaust gases, is tasteless, odorless and a deadly poison!

Do not attempt to work on this unit unless the remote control cable has been disconnected.

Do not service with gasoline while the unit is operating or in proximity to an operating transmitter.

Avoid spilling gasoline on the unit when filling the fuel tank.

POWER UNIT PE-99-B



1. Air Cleaner
2. Fuel Gauge
3. Fuel Tank Cap
4. Tool Box
5. Oil Can
6. 6-Volt Battery
7. Skid Base
8. Air Shroud

Figure 1.—Power Unit PE-99-B, Tool Compartment Side

SECTION I—DESCRIPTION

1. **GENERAL.**—*a. Description.*—Power Unit PE-99-B is a self contained, gasoline-engine driven electrical generator. The unit will furnish 7.5 kva, 120-volt, 60-cycle, 3 phase, alternating current. The engine is mounted forward of and above the generator on a welded steel skid base and is driven by means of 5 parallel V-belts.

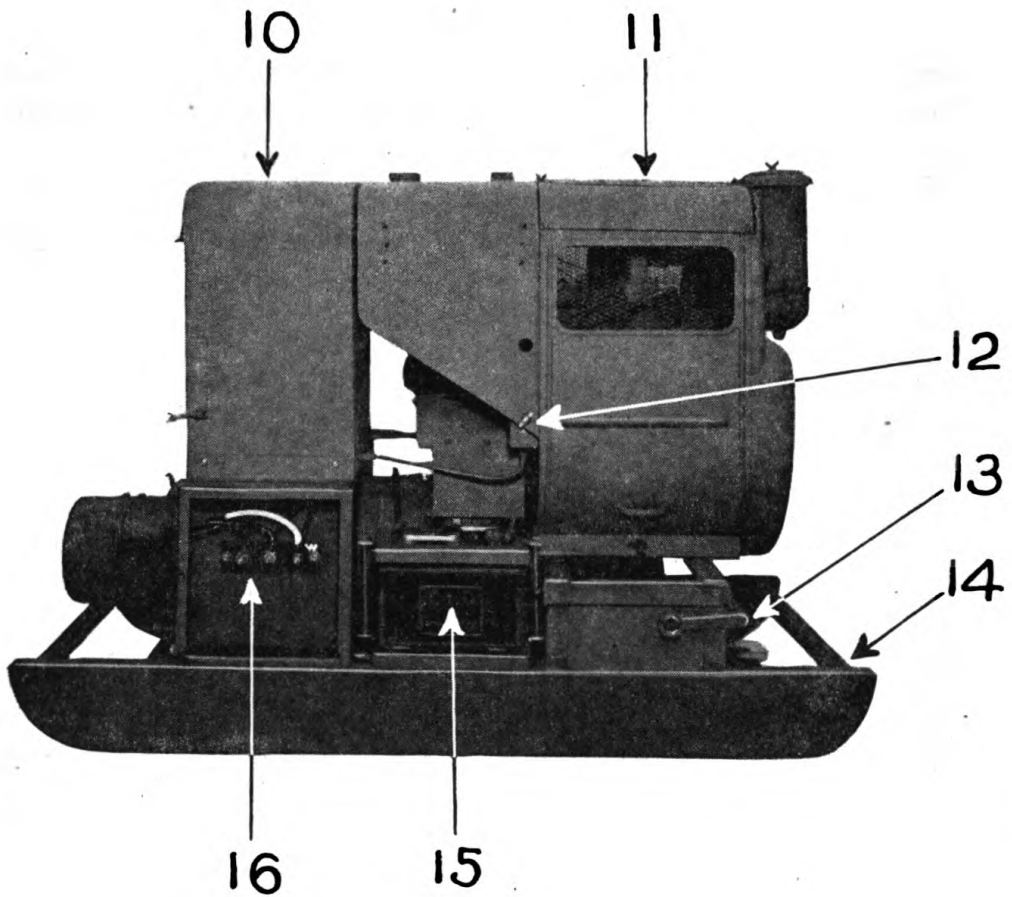
b. Components.—Power Unit PE-99-B consists of the following components:

- (1) One four-cylinder, four-cycle gasoline engine.
- (2) One 120-volt, a-c generator with exciter.
- (3) Two six-volt storage batteries.
- (4) One steel-enclosed control panel.
- (5) One engine exhaust muffler and flexible exhaust tube.
- (6) One remote control cable with Start-Stop switch on a reel.
- (7) One power cable on a reel.
- (8) One set of spare parts.
- (9) One set of tools.
- (10) One spare parts and tool box.

2. **DETAILED DESCRIPTION.**—*a. Engine.*—The engine is a four-cycle, four-cylinder, air-cooled, V-type unit. It has a 3-inch bore, $3\frac{1}{4}$ -inch stroke, 91.9 cubic inch piston displacement and develops 20 hp at 2,200 rpm. A fuel pump is provided to draw fuel from either the built-in or an external fuel tank. A three-way valve, directly below the built-in fuel tank, enables selecting the source from which the fuel is to be drawn. A conventional fuel filter is provided through which all fuel must pass. This prevents foreign matter and water from getting into the carburetor. The engine is cooled by means of a flow of air which is created by a fan-type flywheel and directed by ducts and baffles within a metal enclosure.

b. A-C generator.—The generator is of the revolving field, semi-enclosed, drip-proof type with a direct-connected exciter. Driven at 1800 rpm, it has an output of 7.5 kva, 120 volts, 60 cycles, alternating current. The generator bearings are lubricated by means of pressure-gun fittings through which semi-fluid grease is forced to the bearings by use of a pressure grease gun.

c. Assembly.—(1) The entire unit, including the engine, generator and accessories is mounted on a welded steel skid base and frame. The engine is completely enclosed within a sheet metal housing. An adjustable mounting is provided for the generator to enable adjustment of the generator drive belts. A fuel tank of 7

POWER UNIT PE-99-B

- 10. Control Cabinet
- 11. Engine
- 12. Switch for Hand Cranking
- 13. Hand Crank
- 14. Pipe to Insert Bar for Carrying Unit
- 15. 6-Volt Battery
- 16. Terminals for Power Cables

Figure 2.—Power Unit PE-99-B, Terminal Side View

SECTION I

gallons capacity is housed at the top center of the unit and protected by a sheet metal shield. The control panel, on which all necessary switches, meters and voltage regulating equipment are mounted, is housed within a sheet metal cabinet at the opposite end of the unit to the engine. This cabinet is provided with a removable door to permit access to the various switches and controls.

(2) Two six-volt storage batteries, which supply the necessary power for the starting motor, are mounted on the skid base, one on each side of the main generator. These batteries are connected in series by a connecting cable extending across the top of the a-c generator. The tool box is mounted on the skid base and acts as a support for one side of the control panel cabinet. The other side of this cabinet is supported on a metal cabinet which houses the power cable terminals.

d. Starting equipment.—This unit is provided with a three-position switch to enable starting either by means of the electric starter or, in an emergency when the batteries are in a discharged condition, by means of a hand crank. The starting motor is of conventional automotive type with Bendix drive and is mounted at one side of the crankcase. A START button is provided on the control panel to enable starting the unit from a local position, while a remote control switch, attached to the end of the remote control cable, is furnished to enable starting and stopping the unit from a remote position.

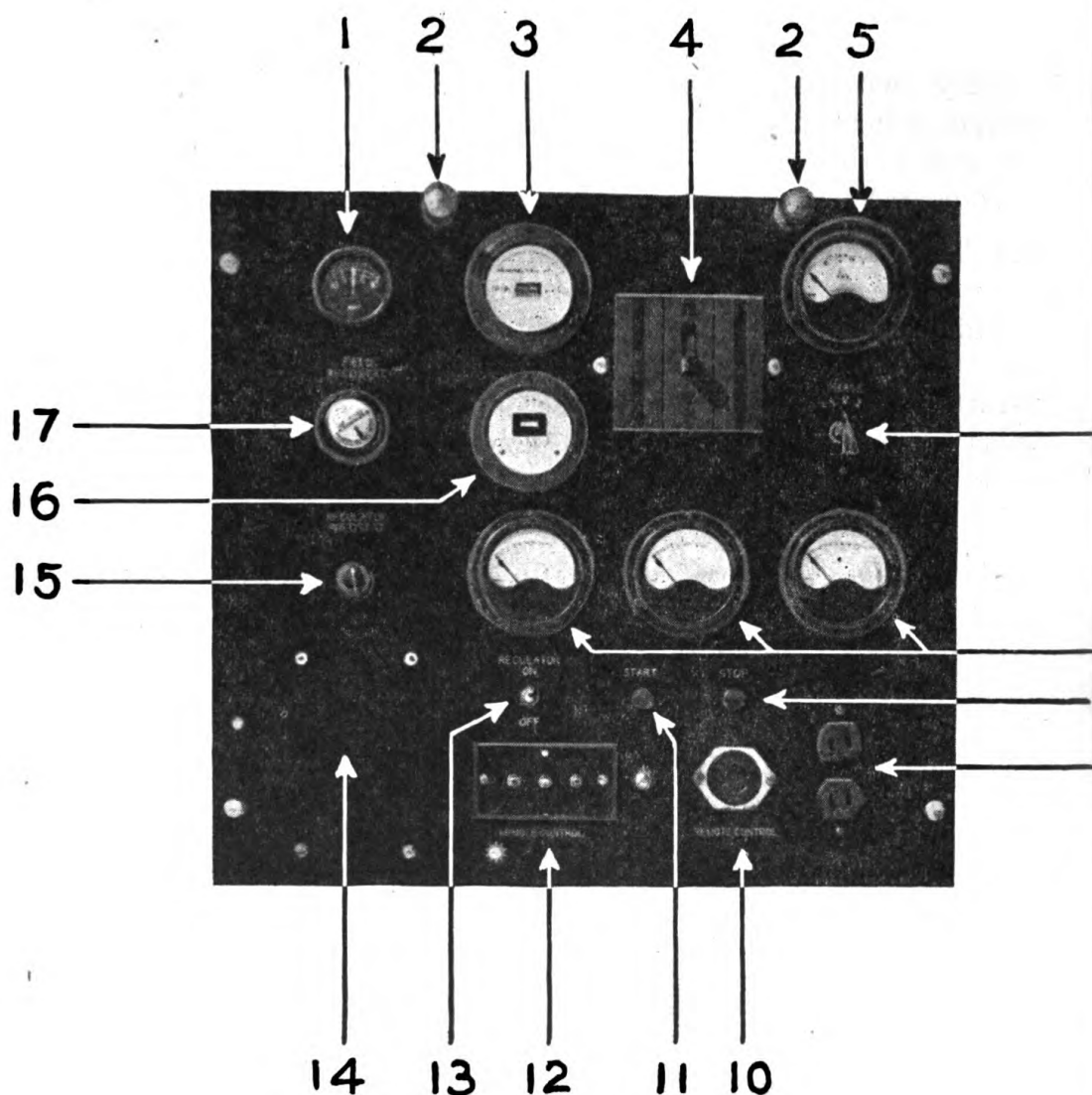
e. Ignition.—A high tension magneto of special design provides the necessary spark for igniting the fuel within the cylinders. This magneto is furnished with an impulse coupling.

f. Carburetor.—The carburetor is of the fixed jet, float feed type, and is provided with an automatic choke to aid in starting. The throttle is controlled by a mechanical governor of the flyball type.

g. Control panel.—The control panel is made of steel and is completely housed within the control cabinet. On it are mounted the following:

- 1—Elapsed-time meter.
- 1—Voltmeter, 0-150 volts a-c.
- 1—Three-position, phase-selector switch.
- 3—Ammeters, 0-50 amps. One for each phase.
- 1—Three pole, 60 amp. circuit breaker.
- 1—Two wire, 15 amp. duplex receptacle.
- 3—Binding posts for remote control connections.

POWER UNIT PE-99-B



1. Battery Charging Ammeter
2. Panel Lights
3. Elapsed Time Meter
4. Circuit Breaker
5. 0-150 a.c. Volt Meter
6. Phase Selector Switch
7. 0-150 Ammeters
8. Stop Button
9. Convenience Outlets

10. Remote Control Receptacle
11. Start Button
12. Remote Control Terminal Block
13. Voltage Regulator ON-OFF Switch
14. Voltage Regulator (in back of panel)
15. Voltage Regulator Rheostat
16. Frequency Meter
17. Field Rheostat

Figure 3.—Control panel

SECTION I

- 1—Field rheostat and control knob.
- 1—Automatic voltage regulator with control knob.
- 1—Three-contact receptacle for remote control cable.
- 2—Pushbutton-type switches; one START; one STOP.
- 1—Three-position toggle switch for voltage regulator.
- 2—Twelve-volt, dash-type lamps.

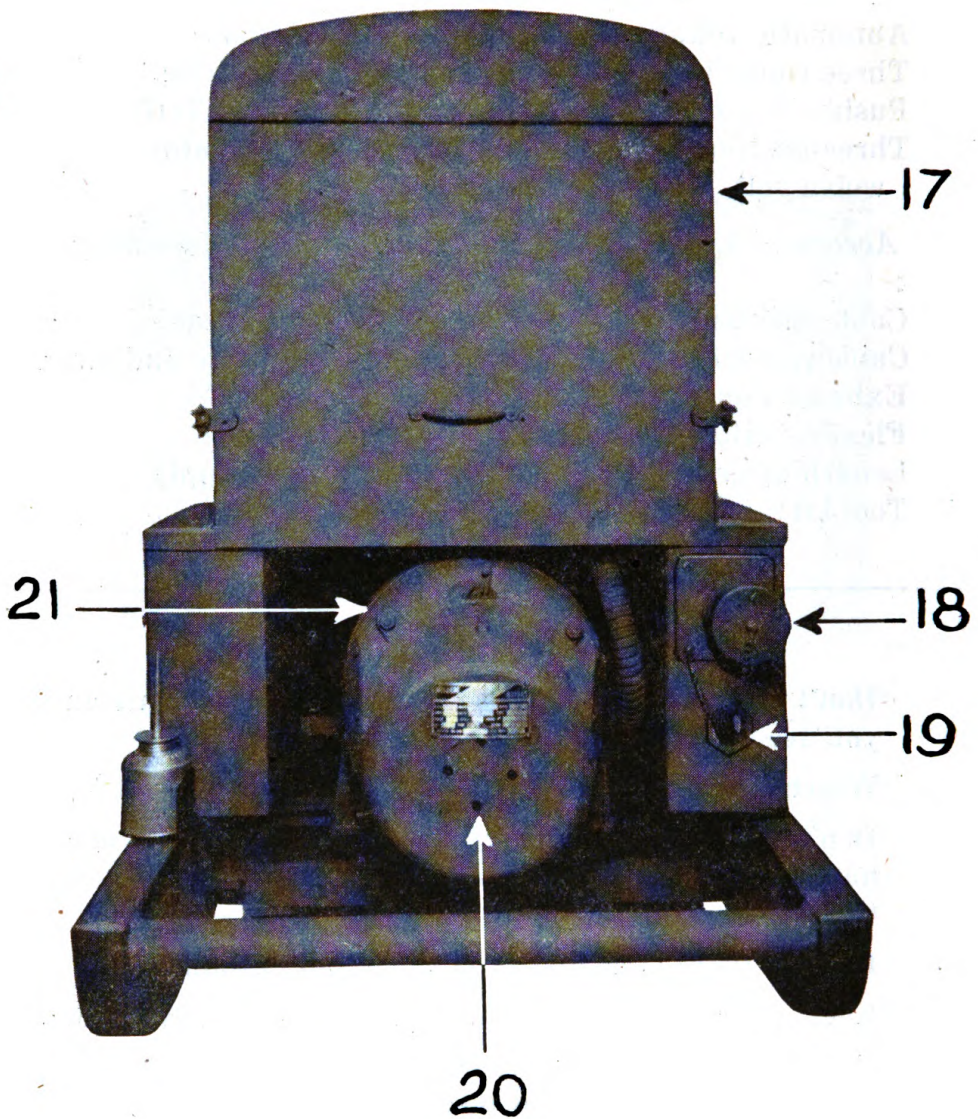
h. Accessories.—Each unit is supplied with the following accessories:

- 1—Cable reel with 150 feet of three-wire power cable.
- 1—Cable reel with 150 feet of remote control cable and switch.
- 1—Exhaust muffler.
- 1—Flexible exhaust tube.
- 1—Length of flexible fuel line for remote fuel supply.
- 1—Tool kit.

REMEMBER THESE POINTS

1. Don't attempt repairs or adjustments to this unit unless you are sure what you're doing.
2. Watch your lubrication; check the oil level every 5 hours.
3. Don't take chances with carbon monoxide; keep your exhaust line gas tight and be sure you have proper ventilation.
4. Be sure there is no dirt in your oil and gasoline.
5. Keep your air filter clean. Watch this closely in dusty locations.
6. Keep the unit as clean as possible. Dirt on the cooling fins and in the air passages will cause overheating.
7. Don't expose your unit to rain or dampness. Electrical equipment and water don't mix.
8. Look out for shock. Don't touch exposed wires.
9. Go over your unit daily and tighten all screws and nuts.
10. Don't spill gas on your unit when filling the tank. It may catch fire.
11. Always warm up your unit before applying a load.
12. Study this book. Keep it handy. It'll save you plenty of headaches.

POWER UNIT PE-99-B



- 17. Removable Door
- 18. 3 Pole 60 Amp. Receptacle
- 19. Hole for Cables
- 20. Exciter
- 21. Generator

Figure 4.—Power Unit PE-99-B, Exciter End View

SECTION II—INSTALLATION AND OPERATION

3. INSTALLATION.—*a.* Power Unit PE-99-B may be used for either field work or indoor installation. The unit should be installed in as clean, dry, level, and accessible a location as possible. Ample provision for ventilation and cooling must be made. When installed indoors, at least two feet of space must be provided around all sides of the unit.

b. The muffler is attached to a pipe connected to the exhaust manifold, and a flexible exhaust tube is provided to carry exhaust gases away from the unit. (See 3 *e.*)

c. When fuel is to be taken from a remote supply tank, a 20-foot flexible fuel line, supplied with the unit, must be connected from the remote tank to the 3-way valve in the fuel line, and the valve placed in the proper position for taking fuel from this tank.

d. The remote fuel supply connection must be so made that the total fuel lift, by the fuel pump, will not be more than six feet.

e. To install the exhaust hose and muffler, screw the exhaust hose into the fitting provided for it through the hole in the engine housing, and screw the muffler into the fitting on the other end of the exhaust hose.

4. PREPARATION FOR USE.—*a.* Fill the gasoline tank with clean gasoline. Blow through the vent in the filler cap to make sure it is clear. An indicator fuel-gauge is provided on the top of the tank. If a remote fuel supply is used, connect the flexible fuel line from the remote tank to the pump. Set the fuel line valve in the proper position for the supply to be used.

b. Remove the bayonet-type oil gauge, next to the starting motor, 235, figure 14, and see that the oil level is up to the *full* mark. Replenish, or if empty, fill with 4 quarts of oil, through the oil filter, 160, figure 13, in accordance with instructions under Section IV, Maintenance. Fill the air cleaner, 1, figure 1, with the same grade oil as used in the crankcase, to the indicated level.

c. Make the necessary load connections. Terminal studs and a 3-phase receptacle are provided for connecting the 3-phase main load (figure 4). Three single-phase circuit connections are provided. Circuit No. 1 is a duplex, twist-tight receptacle, Circuit No. 2 is equipped with plug receptacles and Circuit No. 3 is provided with a terminal block.

POWER UNIT PE-99-B

d. To start the engine, proceed as follows:

(1) Check the selector switch, 12, figure 2, and make sure its handle is in a horizontal position with the arrow pointing to the right. This switch must be in this position when using the electric starter.

(2) Place the three-way fuel supply valve in the correct position for the fuel supply to be used. Next, if fuel is to be drawn from the local supply tank, open the gasoline shut-off valve below the fuel tank.

(3) Press the START button, 11, figure 3, or operate the remote control switch to the start position. The engine will normally start within a few seconds. If the engine does not start within about 30 seconds, refer to the trouble chart on page 39 and check for the possible cause.

(4) As soon as the unit starts, check the oil-pressure gauge to make sure that the lubrication system is operating properly. Next, check the battery-charging ammeter, 1, figure 3, to make sure that the battery charging equipment is functioning properly. This meter needle will swing to the right to indicate the rate of charge and to the left to indicate discharge. Normally there should be no discharge indicated while the unit is in operation or standing idle.

(5) Permit the unit to operate without load for about 15 minutes, except in cases of extreme emergency before any load is applied. The voltmeter, 5, figure 3, will indicate the voltage on the phase at which the PHASE switch, 6, figure 3, is set.

(6) Stop the unit by pressing the STOP button and make the necessary load connections. **CAUTION: Do not make or change load connections without taking due precautions against shock.**

(7) Restart the unit and close the circuit breaker, 4, figure 3. Should the circuit-breaker kick out, it is an indication of an overload and the load should be checked before again closing the circuit-breaker.

e. *To prime the motor.*—If the motor fails to start, the carburetor may be incorrectly adjusted or dirty, the fuel line dirty or clogged, or the gasoline tank empty. To determine the cause, check the fuel supply and prime the motor by removing the spark plugs and pouring a small quantity of gasoline into the cylinders. Replace the spark plugs and crank the motor. If it fires for three or four revolutions and stops, the difficulty is definitely in the fuel system. If motor will not fire at all, check the ignition system, and refer to the trouble chart for possible cause.

SECTION II

f. Starting with dead battery.—When necessary to start the engine with a dead battery, remove the starting crank, 13, figure 2, and insert it in the hole in the center of the air shroud, 8, figure 1. Push the crank in until it contacts the end of the crankshaft and rotate it clockwise until it engages the starting pin. Next, set the switch, 12, figure 2, with the handle horizontal and the arrow pointing to the left. Crank the engine by pulling up quickly on the starting crank. Never attempt to push down on the crank as serious injury may result if the engine should backfire. To stop the unit, when operating with a dead battery, throw the switch, 12, figure 2, to a perpendicular position with the arrow pointing up. This switch should be set with the handle horizontal and the arrow pointing to the right when the electric starter is being used.

g. Voltage regulation.—Voltage is automatically regulated by the automatic voltage regulator mounted on the back of the control panel and adjusted by the knob, 15, figure 3. Voltage may be adjusted by means of this knob while the unit is in operation. The automatic voltage regulator may be disconnected by throwing the toggle switch, 13, figure 3, to OFF. This automatically transfers the voltage regulation to the field rheostat which is adjusted by means of the knob, 17, figure 3.

5. BATTERY INSTRUCTIONS.—*a.* When ready to place the battery in service, remove the wooden stoppers from the holes in the filler plugs. Remove the filler plugs and if the batteries are dry-charged, fill all cells with battery-grade electrolyte. Use 1.258 (32° Baume) specific gravity (tropical countries—1.225, (27° Baume)). Electrolyte is supplied with the unit when dry-charged batteries are supplied. After filling, allow the battery to stand until the temperature of the electrolyte has dropped to 90° F (32° C) or lower. Add electrolyte so that it is about one-half inch above the top of the separators. Then charge at a 7-ampere charging rate.

b. While charging, test the center cell with an all-glass thermometer. Keep the temperature below 110° F (43.3° C) (125° F, 51.6° C for tropical countries) while charging. To reduce the temperature, lower the charging rate or stop charging until the solution cools. It will require from 24 to 40 hours to bring the battery to a fully charged condition. After 20 hours of charging, take hydrometer readings. The battery is fully charged when there is no further rise in specific gravity during five consecutive hours of charging.

NOTE: In tropical countries, reference to specific gravity of 1.285 (32° Baume) will be interpreted as 1.225 (27° Baume).

POWER UNIT PE-99-B

c. If at the end of the charge, the specific gravity in any cell is above 1.285 (32° Baume), remove some of the solution and add distilled water. Add electrolyte if the specific gravity is low, and continue charging for one to two hours to mix the solution. All cells should read 1.285 (32° Baume) before the battery is placed in service at 80° F (26.6° C) with the solution level one-half inch above the separators.

CAUTION: Be sure the wooden stoppers have been removed from the vent plugs to allow gas to escape from the battery cells.

d. *Battery power rating:*

Minimum capacity at 20-hour rate—116 ampere-hours.

Minimum time at 300 amperes 0° F—4.3 minutes.

Minimum 5 sec. voltage at 300 amperes 0° F—4.35 volts.

Maximum overall dimensions—length 10 $\frac{1}{4}$ in., width 7 in., height 9 $\frac{3}{16}$ in.

e. Type 2 H batteries have rubber containers and separators.

6. AUTOMATIC VOLTAGE REGULATOR.—a. The regulator ON-OFF switch, 13, figure 3, is used to place the automatic voltage regulator either in or out of the circuit. With this switch in the OFF position, the generator voltage may be manually regulated by means of the field rheostat, 17, figure 3. When this switch is ON, the automatic voltage regulator resistance is in the field circuit and automatic regulation will take place. Line voltage may be adjusted by means of the knob, 15, figure 3, which adjusts the automatic voltage regulator rheostat. It is not necessary to turn the regulator OFF when the unit is shut down as the regulator will function normally as soon as the unit is again started.

b. When the unit is first started, set the automatic regulator rheostat in the maximum resistance position and gradually reduce the resistance until the a-c voltmeter, 5, figure 3, reads between 100 and 140 volts. Automatic voltage regulation should begin between 100 and 140 volts. Failure of the automatic regulator to function at this voltage is an indication of faulty wiring and the connection should be checked.

SECTION III—FUNCTIONING OF PARTS

7. REFERENCES.—The functioning of internal combustion engines, carburetion and ignition systems is completely covered in the following technical manuals:

TM 10-570—The Internal Combustion Engine.

TM 10-550—Fuels and Carburetion.

TM 10-580—Automotive Electricity.

8. AUTOMATIC CHOKE CONTROL.—*a. Description.*—(1) The automatic choke control is a unit operating independently of the carburetor unit. While the function of the choke control unit is to furnish the proper amount of choke valve opening during the cranking and warming-up period of the engine, its operation depends entirely upon manifold vacuum and heat on the thermostat spring.

(2) The vacuum piston, link and lever assembly, 6, figure 5, opens the choke valve when the engine begins to fire. This is accomplished by means of a rod hook-up from a lever on the automatic choke control unit to a choke lever attached to the choke valve-stem of the carburetor unit.

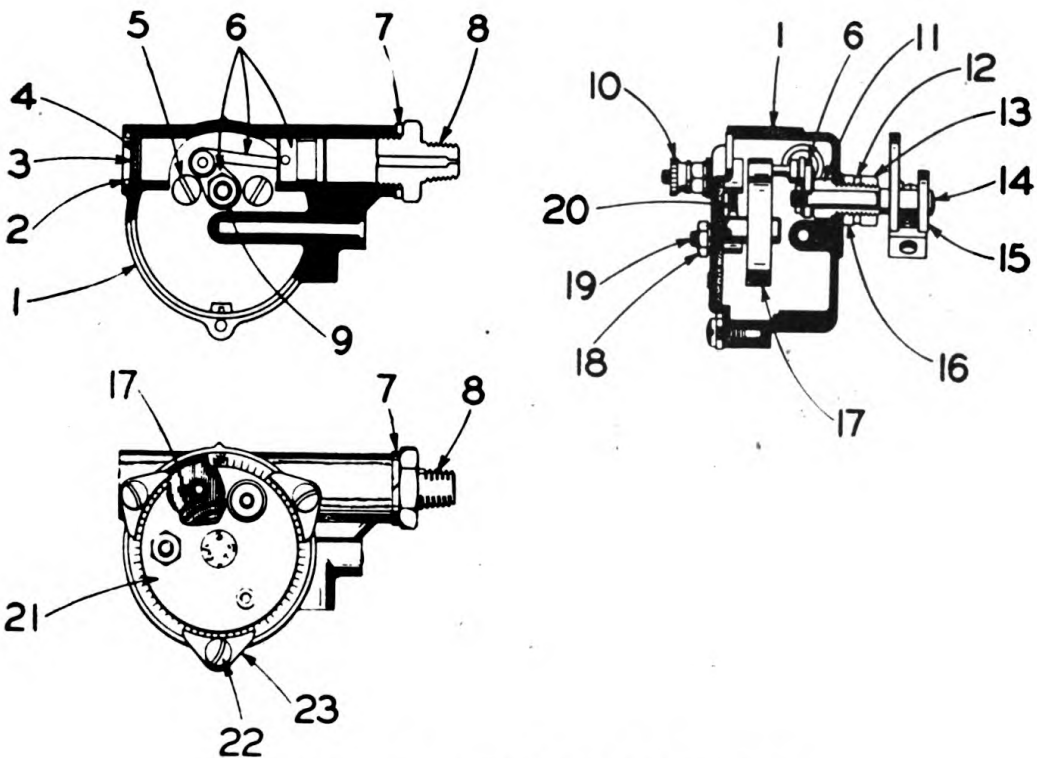


Figure 5.—Automatic choke diagram

POWER UNIT PE-99-B

b. Functioning.—(1) When the engine ignition is turned off and the engine allowed to stand, the heating coil, 20, figure 5, in the thermostat assembly, 21, figure 5, cools, since its source of heat derived from the same current source as that which supplies the ignition, is no longer present.

(2) As the heating coil cools, the thermostat spring, 17, figure 5, also cools and gradually rotates the choke lever, 15, figure 5, closing the choke valve in the carburetor. The automatic choke control and choke valve remain in this position while the engine is not in operation, and also during the cranking period.

(3) The thermostat assembly, 21, figure 5, is directly connected at the hot wire post, 10, figure 5, by a wire to the ignition switch of the engine. When the ignition switch is turned on, the thermostat heating coil, 20, figure 5, is heated by the passage of current through it.

(4) When the engine is started, a vacuum is created in the manifold. The automatic choke unit, connected by means of a tube from the vacuum line union, 8, figure 5, to the intake manifold, is now subjected to the manifold vacuum which actuates the vacuum piston, link and lever assembly, 6, figure 5. As the heating coil, 20, figure 5, heats up, with the closing of the ignition switch, the thermostat spring, 17, figure 5, also tends to heat and lose its tension. This enables the vacuum piston, through its link and lever assembly, to pull in a direction opposite to the spring tension and actuate the choke lever, 15, figure 5, so as to open the choke and permit normal operation of the engine.

9. IMPULSE COUPLING.—The impulse coupling facilitates starting the engine, and at the same time automatically retards the ignition spark while starting. Through this device, the rotor of the magneto is held back while the engine is turned over to its firing position at which instant the pawls of the coupling release and the rotor is snapped forward at high speed, thereby producing an intense spark, automatically retarded to prevent backfiring. Since the ignition spark must occur each 90° of its rotation, two stop-pins are required to engage the coupling pawls at proper intervals. To provide positive pawl action over the cranking speed range, individual torsion-type pawl springs have been provided, with the result that a certain amount of impulse action may be expected up to 500 rpm.

10. VOLTAGE REGULATOR.—*a. General.*—(1) The voltage regulator is an instrument which performs the functions of an auto-

SECTION III

matic field rheostat to provide a simple, effective and automatic means for obtaining almost constant voltage for all normal load conditions.

(2) The regulator consists mainly of a solenoid, a commutator, and two resistor plaques.

(3) The solenoid coil is connected to the a-c generator, and is affected by voltage changes which actuate the solenoid plunger and also the cross arm which moves the carbon contact across the silver commutator, thereby adjusting the resistance of the plaques to a value which maintains the generator voltage.

(4) The regulator has two electrical circuits. One consists of a solenoid coil, a voltage dropping resistor and an external control rheostat. The other consists of a voltage regulating resistor, which is actually the exciter field rheostat.

(5) Both the voltage-dropping resistor, which limits the impressed voltage on the solenoid coil, and the regulator resistance, which adjusts the exciter field current, are embedded in and equally divided between the two plaques. The external control rheostat is not located in the regulator but is mounted separately on the switch-board panel.

(6) The commutator consists of a stack of insulated silver segments, each segment connected to a tap on the regulator resistor. The commutator is of a "V" shape and the carbon contact roller rests on the commutator at two points, thereby short-circuiting all of the resistance included between these two points. By moving the contact roller transversely across the commutator, the distance between these two points of contact is changed and thus the effective resistance of the voltage regulating resistor is adjusted.

(7) The solenoid is of the a-c, quick-acting type and allows the regulator momentarily to over-correct and then find a new steady-state position. The contact roller is not in constant motion, moving only when regulating action is demanded.

b. Theory of operation.—(1) Reference to the wiring diagram (figure 29) will assist in understanding the operation of the regulator.

(2) Since the solenoid is energized from the a-c generator, any change in a-c voltage will cause motion of the solenoid plunger. The resulting motion of the arm and contact roller changes the resistance in the exciter-shunt field circuit so as to restore the a-c voltage to its original value.

POWER UNIT PE-99-B

(3) Assume that the load on the generator increases. The regulating cycle then is:

(a) The a-c voltage decreases.

(b) The current in the solenoid coil also decreases, causing the plunger and the contact roller to move, short-circuiting segments of the commutator.

(c) As the number of segments short-circuited increases, the resistance of the exciter-shunt field circuit decreases.

(d) The exciter-shunt field current therefore increases, resulting in an increased exciter-armature voltage and generator field current, restoring the a-c voltage.

SECTION IV—MAINTENANCE

11. LUBRICATION.—*a.* High-grade, highly refined oils, corresponding in body to the SAE (Society of Automotive Engineers) Viscosity Numbers listed below, will prove economical and assure long engine life.

Summer—Above 32° F—SAE 30 (intermittent full load or sustained partial load).

Winter—(32° F to 0° F)—SAE No. 10.

Below—0° F—Dilute SAE 10 with one percent gasoline for each degree of temperature below 0. Dilution must never exceed 40 per cent.

NOTE: Follow summer recommendation in winter if engine is housed in a building where the average temperature is over 50° F.

b. Add oil regularly.—A motor which is run without oil will be ruined within a few minutes. Always fill the oil reservoir to the full mark on the oil level gauge after each 5 hours of motor operation. The capacity of the oil reservoir is 4 quarts.

c. Change oil frequently.—**THE OIL SHOULD BE DRAINED AND FRESH OIL ADDED AFTER EVERY 50 HOURS OF OPERATION.** Remove the drain plug, located below the oil level gauge, and let the oil flow into a pan or other receptacle. This should be done while the engine is warm. Replace the drain plug, refill with fresh oil and replace the breather cap. Note the condition of the drained oil and change the oil filter element when the oil becomes discolored.

SECTION IV

12. FUEL.—*a.* A good grade of fresh clean gasoline is recommended. Be sure that the small vent hole in the gasoline tank cap is not clogged up; air must enter the tank to allow the gasoline to flow to the carburetor. Test by blowing through the vent hole in the top of the cap. If the fuel pump is used, the line connections must be tight to prevent air-lock in the line.

b. Avoid gummy gasoline.—To avoid trouble from gum formation, keep the tank full when not using the motor. If used only occasionally, drain the tank completely and refill it when the motor is used again.

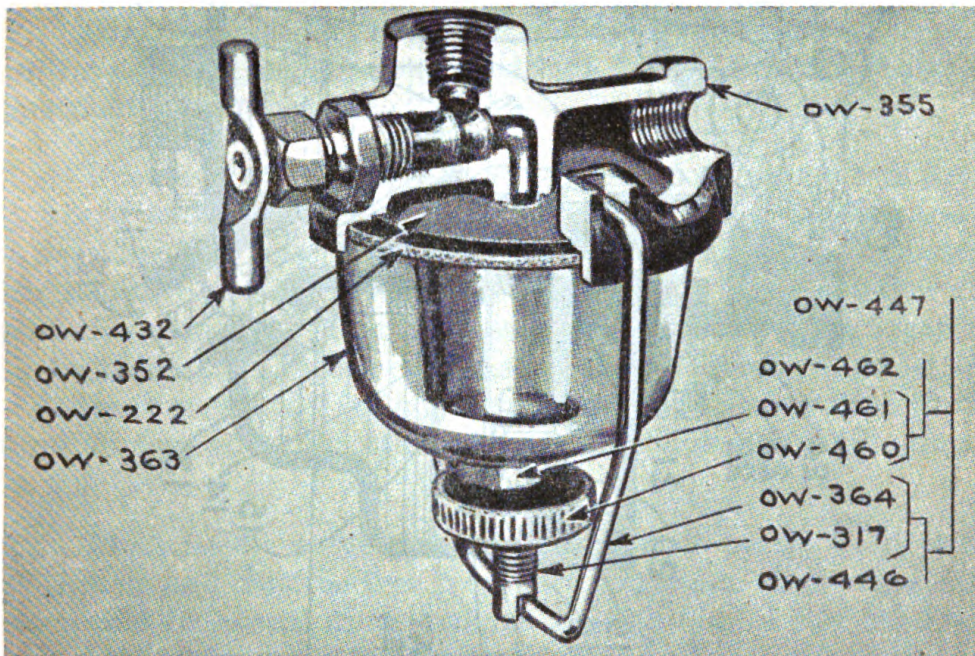


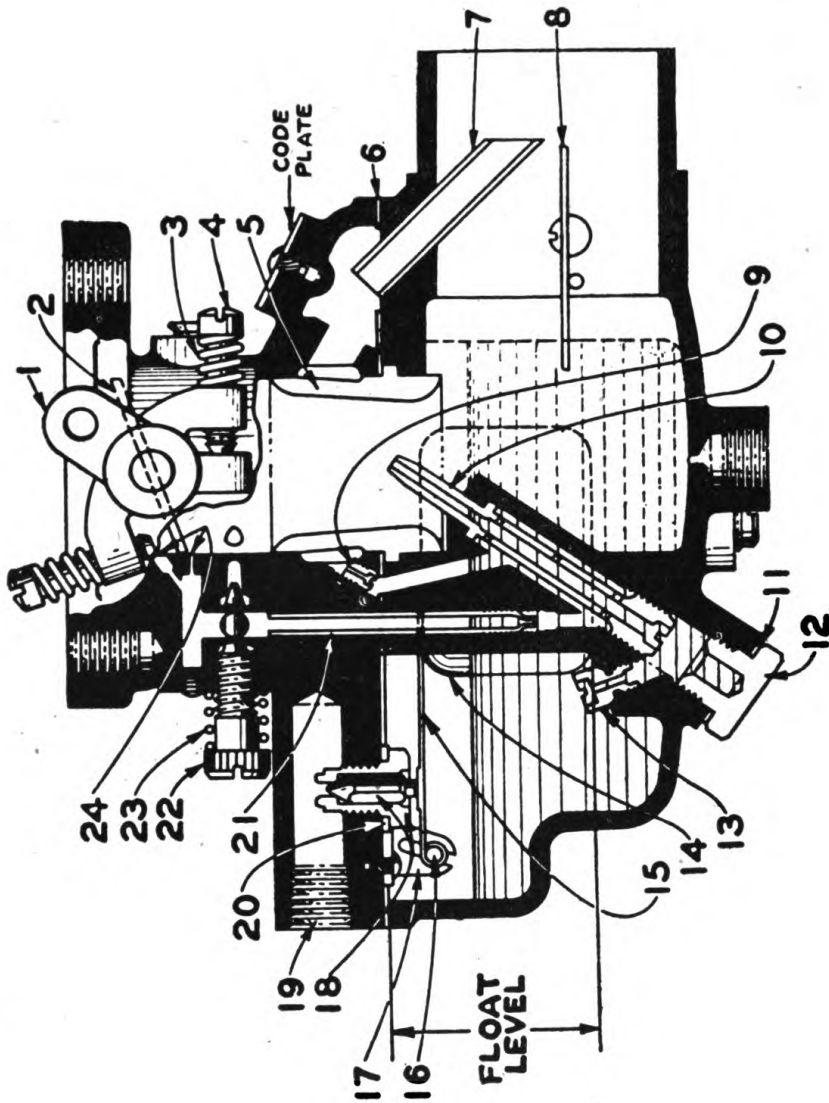
Figure 6.—Fuel filter

13. TO CLEAN THE FUEL LINES.—Disconnect the gasoline line at the carburetor and also at the gas filter. Blow through the gas line to clear it. To clean the gas filter, first close the shut-off valve, 432, figure 6, and loosen the thumb screw, 460, figure 6. Remove and clean the glass bowl, gasket and screen. Reassemble the gasoline filter, using a new gasket if any leakage is noticed. Open the shut-off valve to see if gasoline flows freely from the tank.

IMPORTANT: If you find a gummy varnish-like substance, alcohol or acetone will dissolve it.

14. CARBURETOR.—*a. Description.*—The carburetor is of conventional float-feed type. The float chamber is built concentric

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1. Throttle Lever
2. Throttle Valve
3. Throttle Lever Stop Screw
4. Throttle Lever Stop Screw
5. Venturi
6. Main Body Gasket
7. Vent Tube
8. Choke Valve
9. High Speed Bleeder
10. Main Discharge Jet
11. Main Jet Plug Gasket
12. Main Jet Plug
13. Metering Jet
14. Float
15. Float Lever
16. Float Fulcrum Pin
17. Float Hanger
18. Float Needle Valve & Seat
19. Gas Inlet
20. Float Needle Valve and Seat Gasket
21. Idle Tube
22. Idle Needle Valve
23. Idle Needle Valve Spring
24. Idle Discharge Holes

Figure 7.—Carburetor cross section

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to the main discharge jet, thus practically surrounding the main metering system with fuel. This permits a supply of gasoline to be present at the main discharge jet even though the motor is set at an angle. The float used is so constructed that two halves of the float operate on either side of the float chamber. They are connected by means of a single lever to the float needle valve. The float mechanism is of the hinge type, which assures positive shut-off under all conditions. The carburetor is entirely sealed and all air for venting and bleeders is taken through the air horn.

b. Adjustment.—The engine is governor controlled. The mixture for normal speeds is controlled by a fixed metering jet and no adjustments are necessary.

(1) *Fuel level.*—The gasoline level in the float chamber is properly preadjusted and should not be readjusted unless the carburetor has been handled roughly or the level has been changed from some other cause. The level is set at $15/32$ inch to $17/32$ inch below the top of the main body. If it is necessary to reset the level, it can be done by holding the throttle body in an inverted position and setting the floats to measure $1\frac{1}{4}$ inches from the top of each float to the gasket surface of the throttle body, which will give the approximate fuel level.

(2) *Float needle valve and seat.*—The float needle valve must seat tightly and must be free from dirt and wear. A poorly seated float-needle-valve will cause leakage and too high a fuel level will result. A high fuel level will cause flooding of the carburetor and too rich a mixture. This condition also will cause hard starting, especially if the engine is warm from previous running. To clean or replace the float needle valve and seat, the float fulcrum pin, 16, figure 7, should be withdrawn, allowing the float to be removed. This will expose the float needle valve and seat.

c. Cleaning carburetor.—(1) If any of the various passages or jets in the carburetor become clogged, it may be necessary to take the carburetor apart for cleaning. This should not be done unless absolutely necessary. First remove the upper half of the carburetor from the lower half, or main body, by removing the four small screws holding these parts together. The main high-speed jet, 12, figure 7, should then be removed. The main discharge-jet, 10, figure 7, and the metering-jet, 13, figure 7, can then be removed with a screw driver. The high-speed bleeder, 9, figure 7, may likewise be removed.

(2) The idler tube, 21, figure 7, can be removed with a pair of pliers. The idle needle valve, 22, figure 7, can be removed by hand. The small plug directly over the idle needle valve, 22, figure 7, should be removed with a screw driver, which will expose the idle discharge holes, 24, figure 7. After all of these jets and passages have been cleaned, the parts should be reassembled, care being exercised that all gaskets are replaced and, if necessary, new gaskets used. Unless personnel doing this work is thoroughly familiar with carburetor construction, it is advisable to replace the various jets as they are removed and cleaned. This will prevent mistakes in reassembly.

CAUTION: Do not attempt to clean jets by forcing a wire through them. Clean them with air.

15. **FUEL PUMP.**—*a.* If the fuel pump is suspected of causing trouble, first make certain that all fuel lines and the fuel filter are not at fault. Check the fuel valve to be sure it is open, or the three-way valve to make sure it is set in the correct position for the fuel supply being used.

b. If everything else has been found to be satisfactory, remove the fuel pump and place its intake opening in a pan of gasoline. With the intake opening submerged, work the rocker arm, A, figure 16, up and down. If the pump is in satisfactory condition, fuel will spout from the outlet hole. If the fuel pump has been found to be inoperative, replace it and return the faulty pump to a higher echelon for repairs.

16. **AUTOMATIC CHOKE.**—*a.* The automatic choke thermostat assembly, 21, figure 5, is preadjusted and under ordinary circumstances it will give many months of satisfactory service. The heating elements, 20, figure 5, have been designed to furnish sufficient heat to provide the correct amount of thermostat tension for choking. Should it become necessary to replace the thermostat unit, the whole assembly should be renewed since the thermostat spring, 17, figure 5, is included in the thermostat assembly as a single unit and replacement of the thermostat spring alone is not recommended.

b. Thermostat setting.—When replacing the thermostat unit, the loop of the thermostat spring must be placed over the pin of the vacuum piston, link and lever assembly, 6, figure 5. (THIS OPERATION IS VERY IMPORTANT, SINCE IT IS NECESSARY THAT THE LOOP OF THE THERMOSTAT BE INSTALLED PROPERLY IN RELATION TO THE PIN OF THE VACUUM

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PISTON, LINK AND LEVER TO OBTAIN THE CORRECT AUTOMATIC CHOKE PERFORMANCE.) After the thermostat assembly has been attached to the automatic choke housing, the thermostat cover should be rotated counter-clockwise until the marking (*) coincides with the projection at the top of the thermostat housing.

c. Disassembly.—

- (1) Disconnect the vacuum line from the automatic choke.
- (2) Remove the thermostat cover screws and “lug” washers. The thermostat cover assembly can then be taken off the choke housing.
- (3) Loosen the locknut and remove the lockwasher.
- (4) Remove the vacuum piston assembly from the housing.
- (5) With a clean rag saturated with acetone or alcohol, thoroughly clean the cylinder walls, removing any foreign material which may have accumulated. Blow out all of the channels with compressed air.

d. Re-assembly.—

- (1) Place the vacuum piston in the cylinder with the slot on the piston assembly in the down position. THIS IS VERY IMPORTANT. DO NOT USE ANY TYPE OF LUBRICANT ON THE PISTON OR IN THE CYLINDER. Place the lever on the choke stem and put on the lockwasher and locknut, fastening the nut securely.

- (2) Adjust as instructed in 16 *b* above.

17.—GOVERNOR—CORRECT MOTOR SPEED.—*a.* The motor speed is automatically maintained at about 2,200 rpm under varying loads by a centrifugal flyball governor, operated from the cam gear. This governor, which is bolted to the timing gear case, automatically controls the engine speed, varying the throttle opening through suitable linkage to suit the load.

b. The linkage between the governor and the carburetor must be properly connected. The governor lever has just sufficient travel to give full movement to the carburetor throttle lever from open to closed position. When the engine is stopped, the governor lever position corresponds to wide open throttle position.

c. The governor has been carefully preadjusted to maintain normal speed under load. Do not re-adjust it unless absolutely

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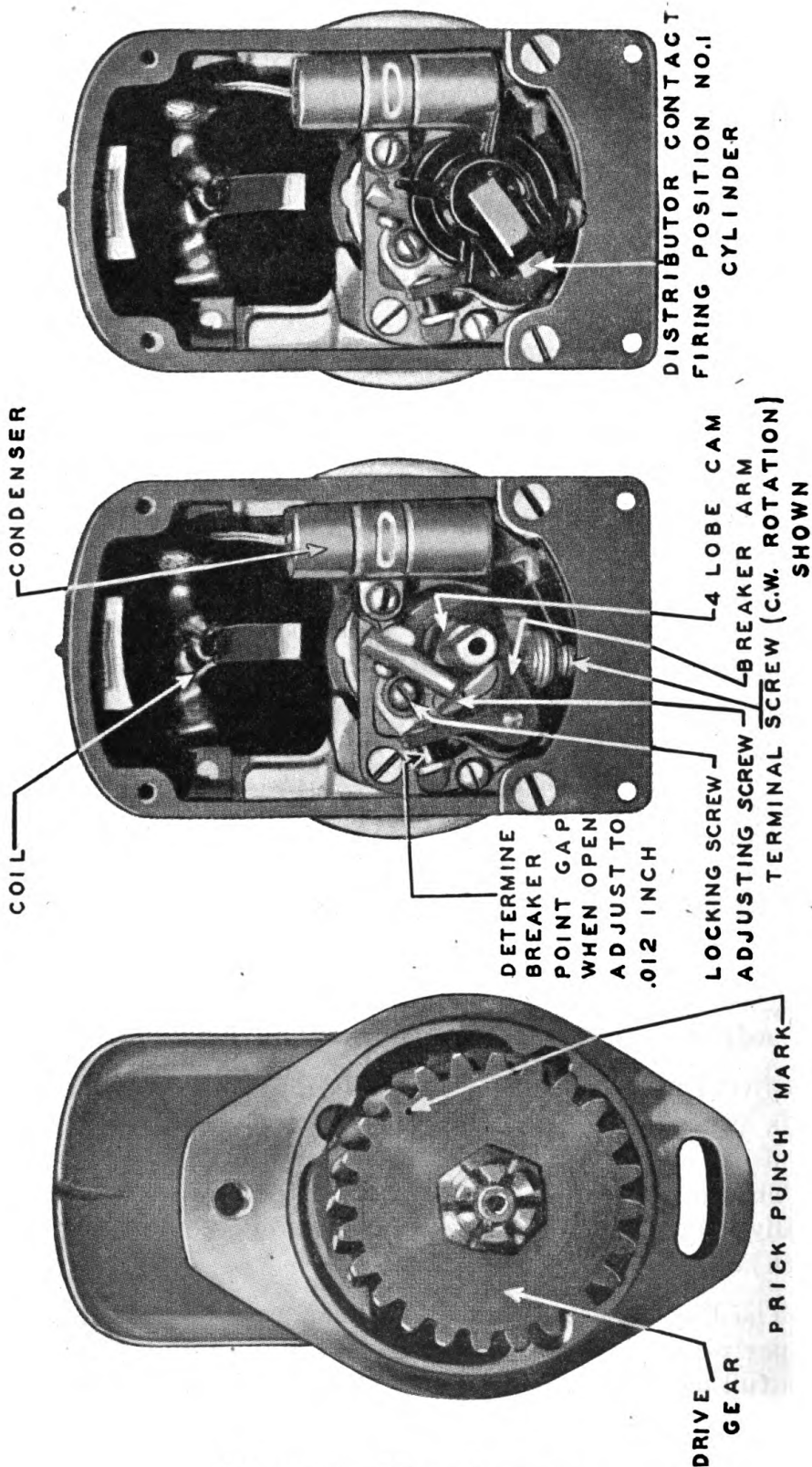


Figure 8.—Magneto parts

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necessary. It can be changed by reducing or increasing the tension of the governor spring. Turn the inner governor spring rod adjustment nut to the right, or clockwise, to increase the engine speed and voltage, and to the left, or counter clockwise, to reduce the engine speed and voltage.

d. Be sure to tighten the outer nut after making an adjustment.

18. IGNITION SYSTEM.—*a. Application.*—The magneto is designed and built for use with these engines, which have a firing interval of 180° between cylinders 1 and 3, 270° between cylinders 3 and 4, 180° between cylinders 4 and 2, and 90° between cylinders 2 and 1. To provide this timing, the magneto has a four-pole magnetic rotor with a four-lobe cam. Four sparks are produced per revolution of the rotor, which runs at crank-shaft speed, in a complete cycle (two revolutions). Four sparks are used for ignition and four occur on the exhaust stroke. The magneto has a standard SAE flange mounting, but a special coupling and gear drive arrangement which requires an extended rotor shaft.

b. Service procedure.—Do not dismantle the magneto unless it has been positively ascertained that the ignition spark produced is unsatisfactory. This condition may be determined through ignition spark tests which are easily made in the field.

c. Testing the ignition spark.—To check if a satisfactory spark is being delivered by the magneto, remove the ignition cable from the plug. Hold the ignition cable terminal about $\frac{1}{8}$ inch from any metal part of the cylinder head (keep hand on insulated part of the cable to avoid a shock). Turn the motor with the starter, and if the spark jumps this gap, the entire ignition system, with the exception of the spark plug, is satisfactory. Check the spark plug and replace it if necessary. If no spark occurs, check the cable, and refer to the magneto adjustments. Ignition tests made while any part of the system is wet are useless.

d. Testing the magneto.—Pull the ignition cables out of the magneto cap sockets and insert a short, stiff wire in one of the sockets. Bend this wire to within $\frac{1}{8}$ inch of the engine block. Turn the engine over slowly and watch carefully for the spark discharge which should occur at the instant the impulse coupling releases. The test should then be repeated for each of the remaining terminals. When a strong spark is observed, do not dismantle the magneto. Thoroughly inspect all cables, terminals and spark plugs. If no spark is observed, the ignition switch should first be carefully

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examined to be certain it has not become accidentally closed, thus shorting the magneto.

e. Distributor cover removal.—In removing the distributor housing cover, care must be taken not to damage the gasket attached to the cover side of the joint. The distributor compartment should be thoroughly cleaned and the air inlet and outlet passages cleared. Examine the high tension lead brush and replace it if it is noticeably worn or damaged. This brush should move freely in its holder and should have a slight spring pressure.

f. Service of breaker contact points.—Contact point adjustment necessitates removal of the distributor housing which has a sealed gasket joint with the metal housing. The contact points should be examined for evidence of pitting or pyramiding. A small tungsten file or fine stone may be used to resurface the points. If the points are worn or badly pitted, they should be replaced. Points should be adjusted to have an .018 inch gap at full separation. Adjustment is made by loosening the round head locking screw at the upper end of the stationary point bracket (figure 8), then turning the eccentric head adjusting screw until the proper gap is obtained and locking the assembly by tightening the round head screw. Always recheck the adjustment after tightening the locking screw to make sure the adjustment has not shifted.

g. Precautions.—Do not oil or grease the bearings or cam of the magneto, as the design eliminates the necessity of field lubrication. The cam felt wick should be replaced by a new impregnated wick if it becomes dry or hard. Coil and condenser replacements, while simple, are not recommended unless test equipment is available. Under no circumstances should any attempt be made to remove the magnetic rotor from the housing as it is locked in a special drive and thrust bearing and specific instructions must be carefully followed in releasing the shaft. When replacing the distributor housing, a new gasket should be provided, the joint cleaned thoroughly and the new seal coated with sealing varnish.

h. Radio shielded units.—On this unit, the plastic distributor cap and cover are replaced by an all-metal housing in which an insulated distributor block is mounted. Special outlets are provided for the high-tension leads so that connection can be made to the shielded cables. The primary ground terminal is located on the lower side of the end cap and is arranged for connection with a shielded cable.

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i. *Special drive gear.*—The magneto is equipped with special drive gears, mounted directly on the impulse coupling. The gear is a slip fit on the extended coupling nut, since movement of the gear with respect to the coupling nut (and rotor shaft) occurs during the impulse period. If it is necessary at any time to remove the drive gear, special care must be exercised in reassembly. First, remove the entire end cap and turn the rotor until the contact segment is in firing position for No. 1 cylinder (figure 8). With the rotor in this position, fit the gear to the coupling lugs so that the prick-punch mark on the rim of the gear is in the position shown.

j. *Firing order.*—The firing order of the cylinders is 1-3-4-2. Number 1 cylinder is the one nearest to the flywheel in the left bank of cylinders, when viewed from the flywheel end of the engine. Number 3 cylinder is the other cylinder in the left bank. Number 2 cylinder is the one nearest to the flywheel in the right bank of cylinders and Number 4 is the other cylinder in the right bank. The cylinders are numbered 1 to 4 on the air shroud near the spark plugs. The flywheel end of the engine is designated as the front end, and the power take-off end, the rear end of the engine.

As these engines are of the V type, the interval between firing of the cylinders is as follows: Crankshaft rotation between the firing of cylinders No. 1 and No. 3 is 180° ; between No. 3 and No. 4 is 270° ; between No. 4 and No. 2 is 180° ; and between No. 2 and No. 1 is 90° .

k. *Magneto timing.*—If it is necessary to retime the magneto, the following instructions will be helpful:

(1) Remove the screen over the flywheel air intake opening by taking out the six screws holding the screen in place. This will expose the mark on the shroud for timing the magneto. See timing diagram, figure 9.

(2) Remove the spark plugs from the cylinders. Then turn the engine over slowly with the starting crank until the compression in No. 1 cylinder blows the air out of the spark plug hole.

(3) The flywheel is marked with the letters "DC" near one of the air circulating vanes. This vane is further identified by a mark cast on the end. (See figure 9.) When the air blows out of the No. 1 spark plug hole, continue turning the starting crank until the edge of the marked vane on the flywheel is on line with the top center. The keyway at the take-off end of the crankshaft is also on top.

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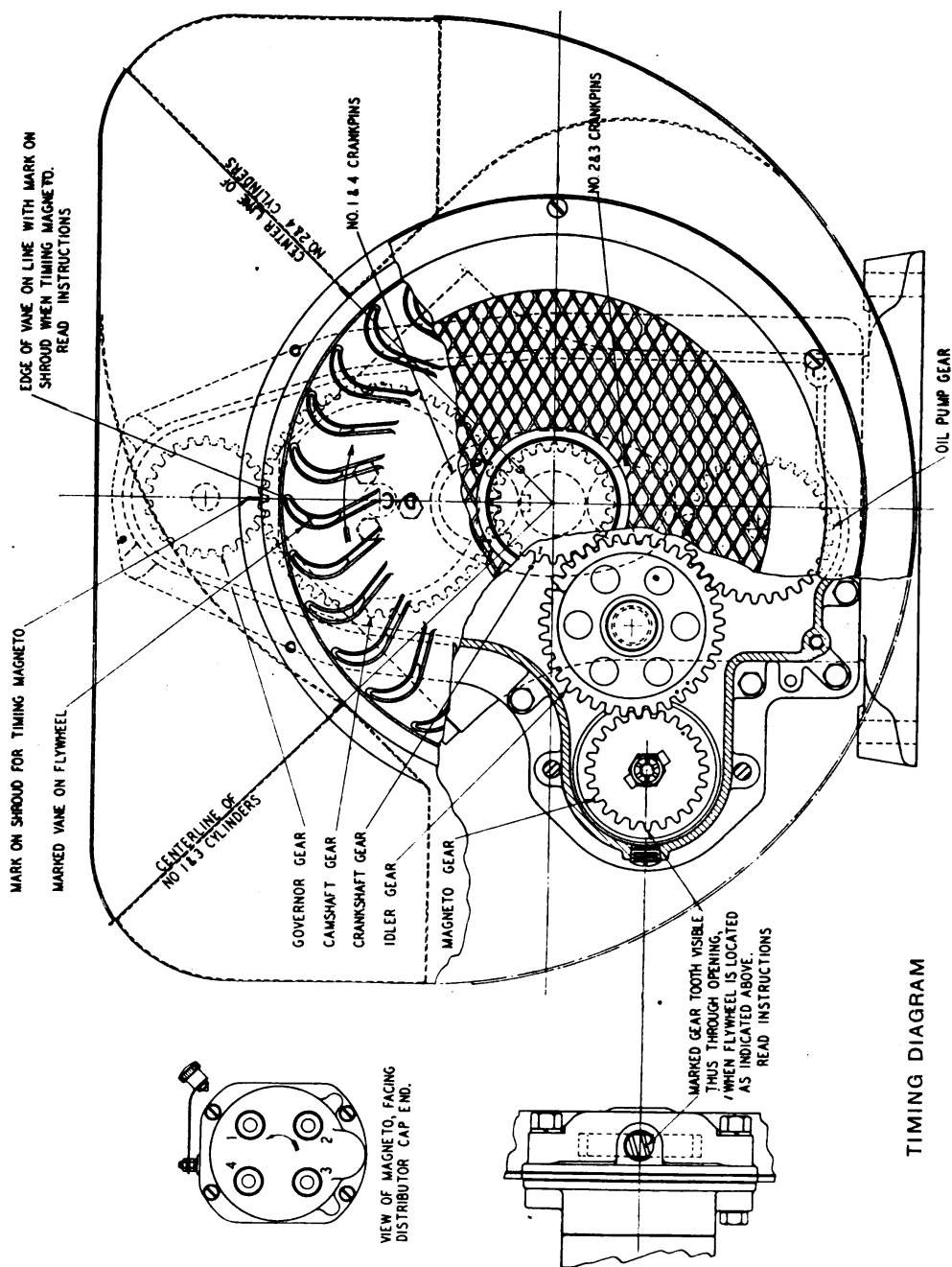


Figure 9.—Timing Diagram

(4) The magneto should then be fitted to the engine so that the marked tooth on the magneto gear is visible through the opening in the timing gear housing as shown on the timing diagram. The distributor cap on the magneto is numbered from 1 to 4. The leads from the magneto should be connected to spark plugs of like numbers, according to the engine fire number.

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l. Spark plug adjustment.—Spark plugs should be cleaned and points reset to .025 inch after each 50 hours of operation. The porcelain prevents the spark from jumping anywhere except at the gap, and if it is cracked or broken, it will prevent the plug from firing. Water on the outside of the spark plug may permit the high voltage current to leak over the surface of the porcelain. Dirt or carbon will do the same thing. Clean the spark plug by washing off the carbon with gasoline, or use fine sandpaper. Points should be scraped or sandpapered. Always keep a spare plug on hand. When reassembling the spark plug to the cylinder head, put a little mica grease on the threads. Do not get grease on the points. The spark plug is shielded to prevent radio interference.

m. Ignition cable.—The spark plug cable insulation must not be broken, soaked with oil or water, or grounded in any way where it touches the motor, as it will interfere with good ignition. The cable is shielded to prevent radio interference.

19. ELECTRIC STARTER.—The starter should be checked over at regular intervals. A thorough inspection will include the removal of the starter from the bell housing, removal of the commutator cover band and removal of the brushes. When the brushes are removed, the commutator should be cleaned.

20. BATTERY CHARGING GENERATOR.—*a.* The battery charging generator is of the ordinary 12-volt automotive type. The generator has a hinge-type mounting, and the belt tension is adjusted by loosening the screw which holds the generator to the adjusting bracket and pulling the generator outward. To replace the battery-charging generator belts, remove the main generator drive belts and place the new belt over the engine drive pulley, and then replace the main generator drive belts.

b. 300-hour complete overhaul.—To completely overhaul the battery charging generator it should be removed from the engine and taken to the bench.

(1) Remove the head band.

(2) Remove the drive pulley and nut. To remove the pulley, use a press or puller. Be careful not to damage the pulley or end head.

(3) Remove the two frame screws at the commutator end and slide the commutator end-plate off the armature shaft. Disconnect the leads at the brush.

(4) Lift the drive end and armature out of the frame and field.

(5) Press the armature shaft out of the drive-end head.

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21. TO REMOVE AND REPLACE FLYWHEEL.—a. Remove the expanded metal cover over the front of the blower housing shroud. Remove the headless set screw, which holds the starting-crank engagement pin in the crankshaft, and remove the pin. Straighten the prongs on the lockwasher which holds the flywheel nut. Tap the end of the crankshaft and the flywheel will free itself. Remove the flywheel through the front opening of the blower housing.

b. To reassemble, place the flywheel key in place on the crankshaft and reverse the procedure outlined in 21 *a.* Be sure the flywheel locknut is locked in place by a lockwasher.

22. CYLINDER ASSEMBLY.—a. The cylinders are cast in pairs of a special alloy iron. Two cylinder heads are fitted. The heads are made of an aluminum alloy especially suited to this kind of service. Both heads and cylinders are provided with ample cooling fins so that the engine will not overheat when operating at full load in the hottest weather.

b. When the cylinder heads have been removed for the purpose of cleaning carbon or grinding valves, care should be used in replacing them. Use new gaskets if possible. Otherwise, clean the old ones and coat both sides with cup grease. Do not use shellac on cylinder head gaskets. Tighten each cap screw a little at a time so that the cylinder heads are pulled down evenly. Screws need be only moderately tight.

23. COMPRESSION.—Proper compression is obtained when valves seat properly, gaskets do not leak and piston and rings are properly fitted. When tuning up a motor, it is always well to check compression. This is done by turning the motor over quickly by hand. If turned slowly, sticky valves may not be detected. If a point of resistance is offered every half revolution, compression should be satisfactory. If the motor turns over without compression resistance for a full cycle, it is possible that a worn piston or piston rings, leaky valves or leaky gaskets are present. See that the spark plugs have a gasket under them and are drawn up tight. Also check the cylinder head gaskets and tighten the cylinder head bolts.

24. VALVE ADJUSTMENT.—a. To check valve clearance, remove the valve cover plate. The correct clearance on the exhaust valve is .012 inch. The clearance of the intake valve is .010 inch. These clearances are to be adjusted when the motor is cold. Tappet clearance is adjusted by means of adjusting screws on the mush-

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room-type tappets. The end of the stem must be square with the stem proper.

b. To reseal the valves, grind in the same manner as automobile valves. If the valves stick, remove gum, lead, or carbon with alcohol or acetone and clean the valve stems thoroughly with a wire brush or emery cloth. Also, scrape all carbon from other valve parts.

c. Valve timing is accomplished through the camshaft gear train, driven off the crankshaft. These gears are properly meshed when the marks on the gears line up with the marks as shown on the timing diagram, figure 9.

25. PISTON.—*a.* The piston in this motor is made of lynite aluminum alloy, which is very light in weight. The standard clearance between the piston skirt and cylinder wall is .003 inch to .0035 inch. This clearance is to compensate for the considerable expansion of aluminum when hot. The top and second lands of the piston are smaller than the skirt in order to allow for greater expansion at the piston head. When the piston is removed, thoroughly clean all carbon from the piston head and ring grooves. If the piston is out of round or scored, it should be replaced. Four rings are fitted to each piston. Three are compression rings and one is an oil-regulating ring.

NOTE: If the piston is badly worn or out of round, check the cylinder bore. If it also shows excessive wear, have it rebored, or install a new cylinder before fitting a new piston.

b. Piston rings.—The piston rings, when fitted in the cylinder, should have a gap of .007 inch. The rings should be fitted in the cylinder within the piston ring travel. Before assembling new rings to the piston, be sure that the piston ring grooves are thoroughly cleaned and that the rings move freely in the grooves.

c. Piston pin.—The piston pin is a slip fit in the piston. To remove it from the piston, first remove the lock rings, then slip the pin out of the piston.

26. CONNECTING ROD.—The crankshaft ends of the connecting rods are direct-babbitted and fitted with laminated shims. The upper ends of the rods are fitted with hard bronze bushings. The oil streams from the oil spray nozzles must strike the fins on the connecting rod caps about 3/16 inch from the low end. If these oil streams strike the fins or connecting rods higher up, the cylinder will receive too much oil.

27. CRANKSHAFT.—The crankshaft is carried on two roller bearings. The cones are a tight press fit on the crankshaft. The outer race of the bearings at the power take-off end of the engine is carried in a plate which is bolted to the crankcase. Under this plate, several shims are fitted for adjusting the bearings. The bearings properly fitted have no end plate when the engine is cold. It is seldom necessary to readjust these bearings for wear, and then the work should be done only by qualified personnel.

28. CAMSHAFT.—The camshaft is made of a special alloy, with the cams and fuel pump eccentric an integral part of the shaft. The driving gear is bolted to a flange by three bolts, and the camshaft is carried on two babbitted bearings.

29. OIL PUMP.—*a.* The oil pump is of the gear type, located in the bottom of the crankcase and extending down into the oil pan. The pump is driven by helical gears from the crankshaft through an idler gear. The suction opening in the oil pump is protected by an oil screen.

b. Lubrication is by a combination of splash and forced feed. The oil is forced by the oil pump into a header which extends the full length of the crankcase. Four nozzles in this header direct oil streams against the fins on the bottom of the connecting rods, and the spray thus formed lubricates all internal parts of the engine.

c. If oil leaks from either end of the crankshaft bearings, remove the base from the motor and inspect the oil seals. Replace the seals if necessary.

30. CARBON.—Excessive carbon is caused by too much oil, which is usually the result of piston rings not seating properly or sticking, too rich a carburetor setting, or wear from long service. An unusual amount of carbon is indicated by the motor knocking or by loss of power. Occasionally, remove carbon from the valves, valve ports, piston head, piston rings and ring grooves, cylinder head and the top of cylinder bore.

31. AIR CLEANER.—Clean the air cleaner occasionally by removing it and washing it in diesel oil. Test to see if it is clogged by blowing through it, or noting if the motor performs better with it off. If clogged, it should be replaced. Keep the oil level up to the beading. Note instructions on the air cleaner label.

32. MUFFLER.—After long periods of service, it is possible that the muffler will become clogged to the point where it will affect the motor's power. To check the muffler, unscrew it from the motor

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and run water into the open end of the muffler. If full streams of water come out of the other end, it is not clogged up and need not be replaced.

33. A-C GENERATOR.—*a.* To obtain maximum efficiency from the generator, attention must be given to the generator bearings, commutator and brushes.

b. The generator bearings must be greased with a semi-fluid grease at least once every 700 hours of service. Pressure lubricating fittings are provided for filling the reservoirs. Where the power unit is being operated for long periods, as in continuous service, these points must be checked more frequently.

c. To adjust the generator belt tension, loosen the four nuts on the bolts which pass through the generator seat. Turn down the adjusting nuts under the generator seat until the belts are tight, then turn down the nuts on top of the generator seat. Make sure these nuts are pulled down tight at all times.

d. **Keep the unit clean and free from oil and dirt, to avoid the possibility of fire.**

e. The commutator is that part of the armature on which the brushes make contact. An inspection of the commutator should be made at regular intervals and any accumulated carbon, dust or dirt removed. The commutator **should never be oiled** and should be kept perfectly clean. If the commutator becomes gummy or sticky, it may be cleaned with a cloth moistened with diesel oil. If the commutator has become burned by arcing brushes, due to dirt or sticking, a strip of No. 00 sandpaper may be used to dress the commutator.

WARNING: Never use emery cloth to dress the commutator.

f. Mica is used for insulation between the commutator segments. When the armature is constructed, the mica is cut away, or under cut, to a depth of about $1/32$ inch below the surface of the segments. In time, the segments will wear down to the level of the mica. If the mica is even with, or projects above, the commutator segments, it should be cut away (under cut) to a depth of about $1/32$ inch (see figure 10). A broken hack saw blade, with the sides ground to the width of the mica, is a good tool for this purpose.

g. After long service, the commutator and collector rings may become burned or roughened. In such a case, the armature should be removed, and the commutator and collector rings turned on a lathe. It will be necessary to under cut the mica after turning.

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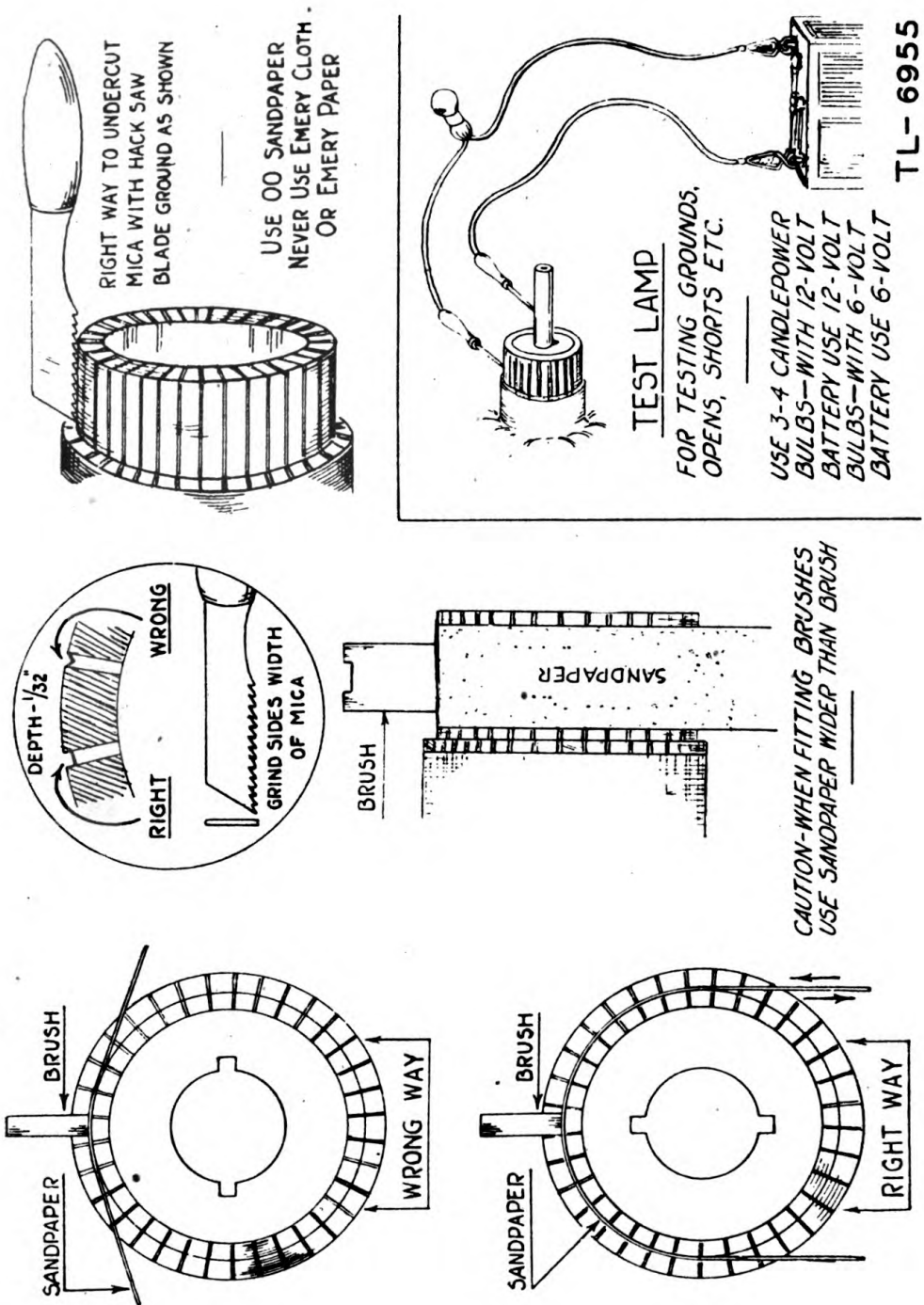


Figure 10.—Brush and commutator servicing

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h. NOTE: Under cutting the mica and turning down the commutator should not be attempted by other than qualified personnel. The generator brushes should receive attention at regular intervals. The brushes must fit in their holders so that they are free to slide without sticking or binding, yet not so loose that they will chatter or get out of alignment. The brushes should press firmly against the commutator, as good contact is essential. If dirty, the brushes may be withdrawn from their holders and cleaned with solvent P-S-661A. Allow all parts to dry thoroughly before reinstalling. If the brushes appear badly worn, replace them. The ends of the brushes must be fitted to the commutator and collector rings on which they ride.

i. To fit new brushes, or reseal old ones, cut a strip of No. 00 sandpaper the width of the brush. Insert the sandpaper with the brush resting on the sanded surface and pull it in the direction of rotation. Do not pull it back and forth. Repeat this operation until the brush is properly seated. See figure 10. The spring tension should be sufficient to press each brush against the commutator with uniform tension. It is very important that each brush have an equal pressure. If one of the springs is too weak, the opposite brush will have to take more than its share of the load, and sparking and damage to the commutator and collector rings will result. NOTE: In general, the above instructions also apply for the battery-charging generator.

CAUTION: Always lift brushes in their holders to clear the commutator when removing or installing the armature.

j. The generator bearings have pressure-gun fittings (31, figure 26). Be sure to keep enough grease in the bearings. Avoid an excess as it will cause difficulty by getting on the brushes.

34. AUTOMATIC REGULATOR MAINTENANCE.—*a.* Other than keeping it free from dust, dirt and moisture, the automatic voltage regulator requires very little attention. Don't attempt to oil or otherwise lubricate any part of the regulator.

b. The contact roller presses on the silver commutator with a pressure of 100 grams. This value is carefully preadjusted and should not require further adjustment. Do not lift the contact roller from the commutator, as the contact pressure spring may be over-stressed, thereby reducing the contact pressure. Never touch the contact roller while the regulator is operating as arcing will occur at the point of contact, causing the commutator surface to

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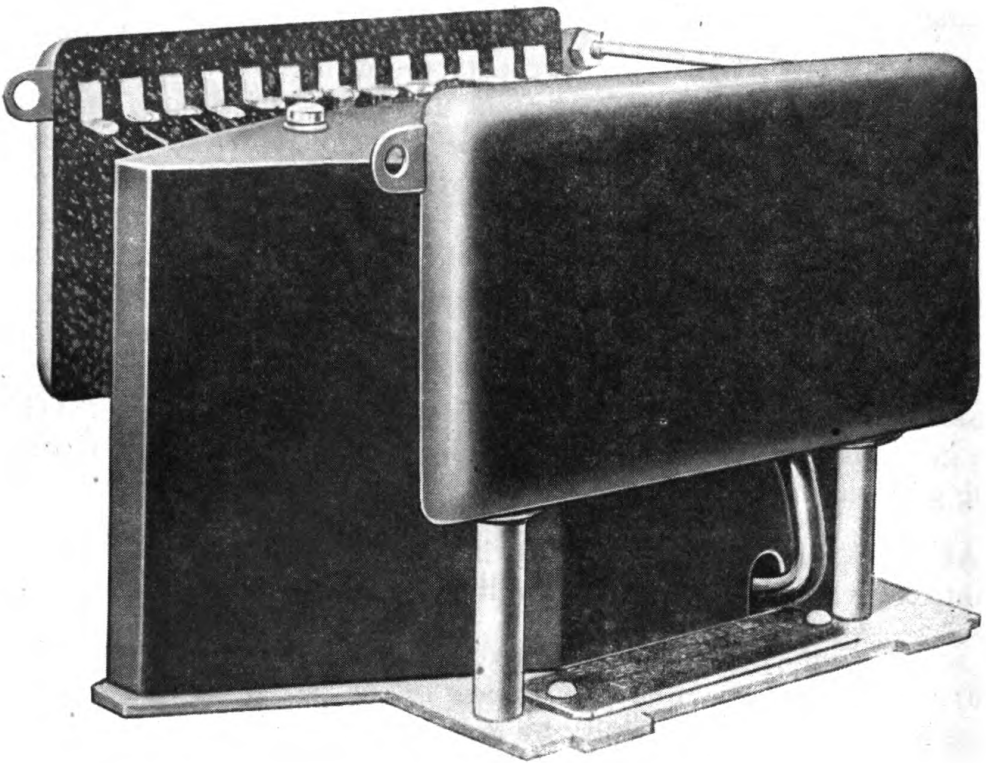


Figure 11.—A-C generator voltage regulator

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become roughened. Polish the surface lightly with jeweler's rouge cloth or crocus cloth. After polishing, be sure to remove all traces of rouge from the surface of the commutator. After the regulator has been operating a short time, a fine black line will appear along the point of contact on the commutator. This is a normal condition.

c. The regulator is preadjusted and should require no adjustment after installation. If for any reason adjustment is necessary, do not attempt to adjust the magnetic core. Any necessary adjustment should be made by means of the solenoid spring. For greater regulator sensitivity, the spring is moved to a lower position on the holder. Raising it to a higher position decreases the sensitivity and increases the stability of the regulator.

d. After any spring adjustment, the coil current should be checked and the spring reset if the current is more or less than its normal value of 0.4 amp. To reset the spring, loosen the spring holder adjusting screw and slide the holder forward or backward, thus decreasing or increasing the spring tension.

e. In making any necessary readjustments to the regulator, an a-c ammeter must be used. Connect it in series with either terminal "A" or "B" to measure the solenoid coil current.

35. OVERHAULING.—*a.* Power Unit PE-99-B should be overhauled about every 1,000 hours of operation. Follow previous instructions given as to proper methods of assembly.

b. Clearances.—

Connecting rod clearance.....	.001 to .002 in.
Piston pin clearance.....	.0005 to .001 in.
Camshaft	
Small bearing clearance.....	.002 to .004 in.
Large bearing clearance.....	.002 to .0035 in.
Valve stem diameter.....	.003 to .005 in.
Tappet stem diameter.....	.0005 to .0025 in.
Tappet clearance	
Cold	
Inlet	.010 in.
Exhaust	.012 in.
Idler gear	.0005 to .002 in.
Spark plug cap.....	.025 in.
Magneto breaker	
Point opening	.020 in.
Piston clearance	.003 to .0035 in.

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Firing order: 1-3-4-2

Interval of Firing:

No. 1 to No. 3 cylinder—180°

No. 3 to No. 4 cylinder—270°

No. 4 to No. 2 cylinder—180°

No. 2 to No. 1 cylinder— 90°

36. DISASSEMBLY AND ASSEMBLY OF CONNECTING ROD, PISTON, ETC. (FIGURE NO. 12).—*a.* Remove the top and rear panels before attempting to work on the engine.

b. Remove bottom cover.

c. Remove cylinder shroud cover and cylinder heads.

d. Through the bottom opening of the crankcase, the connecting rod bolt nuts can be removed which will permit removal of the connecting rod caps. The piston and connecting rod assembly can be pushed out through the top of the cylinder bore. This can be done without removing the engine from the base.

e. To remove the piston from the rod, remove the piston pin snap rings and drive out the piston pin.

f. Reassemble in the reverse manner.

g. Observe the following clearances for correct assembly:

Piston clearance in the bore for cast iron pistons (This is measured at the bottom of the skirt)003 to .0035 in.

Crank pin001 to .002 in.

Connecting rod piston end0005 to .001 in.

Connecting rod side clearance004 to .011 in.

37. DISASSEMBLY AND ASSEMBLY OF OIL PUMP.—*a.* Remove the flywheel.

1. Remove the set screw and drive out the crank pin.

2. Remove the flywheel nut.

3. With a babbitt hammer or brass bar, hit the crankshaft a sharp blow to loosen the flywheel, which fits on a taper. An ordinary hammer may be used with a hardwood block held against the shaft to receive the blow.

b. Remove the flywheel shroud and gear cover.

1. Before the gear cover is pulled off the shaft, be sure to remove the flywheel key.

c. Remove the oil pump gear by loosening the nut which is locked in place with a cotter pin.

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1. The oil pump gear drives the oil pump shaft by means of a woodruff key. After the nut is removed, the gear can be pulled off.

d. To remove the oil pump from the crankcase, remove the screw through the hole in the engine support and withdraw the oil pump assembly through the crankcase opening. The oil pump is fitted into a bored opening in the crankcase and is held in proper location by a set screw.

e. The oil pump cover is fastened with round head screws that can be removed to expose the oil pump gears.

f. The idler gear fits over the idler gear pin.

g. A relief valve is built into the oil pump cover. The relief valve ball is held in position and holds the pressure by means of a spring. Be sure in re-assembling that this relief valve functions.

h. To re-assemble, follow the reverse procedure.

i. The oil pump gears should have .002 inch to .0035 inch clearance in the bore.

38. DISASSEMBLY AND ASSEMBLY OF CYLINDERS (FIGURE NO. 12).—*a.* Remove the governor rod, gasoline connection and choke connection to the carburetor.

b. Remove the nuts on the studs and lift off the manifold assembly with the carburetor.

c. Remove the nuts on the studs and remove the manifold from the cylinder block.

d. Remove the cylinder hold-down stud nuts and remove the entire cylinder block and valve assembly.

e. Re-assemble in the reverse order.

f. Observe the following clearances for correct assembly:

Valve stem clearance..... .003 to .005 in.

Tappet clearance cold, exhaust..... .012 in.

Tappet clearance cold, inlet..... .010 in.

39. DISASSEMBLY AND ASSEMBLY OF CAMSHAFT (FIGURE NO. 12).—*a.* The tappets will have to be held up so they will clear the camshaft lobes. The camshaft and camshaft drive gear can then be withdrawn from the gear cover end of the engine after removing the fuel pump. To remove the fuel pump, remove the two hollow-head cap screws holding the fuel pump adapter and fuel plunger in place and lift them out.

POWER UNIT PE-99-B

- b.* Re-assemble in the reverse order, being sure that the camshaft thrust pin and camshaft thrust pin spring are in place before the gear cover is re-assembled.

- c. The following clearances should be observed for correct assembly:

Camshaft front bearing002 to .0035 in.

Camshaft rear bearing002 to .0035 in.

Valve tappet clearance in crankcase005 to .0025 in.

40. DISASSEMBLY AND ASSEMBLY OF GOVERNOR.—*a.*

Remove the oil line to the governor and disconnect the governor rod and governor spring.

- b. Remove the governor housing cap screws to withdraw the housing and cross-shaft assembly.**

- c. The governor gear and assembly can be withdrawn after the housing is removed.

- d. The governor thrust bearing and thrust sleeve is an assembly and, if replacement is required, it is to be handled as such. Do not attempt to assemble parts in the field as this is very important for proper governor regulation.**

- e.* To re-assemble, follow the reverse procedure. Be sure that the spring is connected exactly as before disassembly.

41. DISASSEMBLY AND ASSEMBLY OF CRANKSHAFT.—

- a* The bearing plate must be removed. With the flywheel and gear cover off, and with the connecting rod disassembled, the entire crankshaft can be withdrawn through the bearing plate opening on the take-off end of the engine.

- b. The roller bearing inner race is pressed onto the crankshaft, while the outer race is pressed into the bearing plate on the take-off end. The outer race of the bearing on the cranking end is pressed directly into the crankcase and held in place by a retainer ring.**

- c. If necessity requires replacement of bearings, the complete bearing should be changed and not just the inner or outer race.

- d.* To re-assemble, follow the reverse procedure.

- e. The crankshaft bearing should be fitted so that the bearings have an end play of approximately .006 inch. The amount of end clearance is governed by shims. By driving the crankshaft from one side to another, the end play can be easily felt.

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42. CYLINDER FIRING SEQUENCE.—

Firing order: 1-3-4-2

Interval of firing:

No. 1 to No. 3 cylinder—180°

No. 3 to No. 4 cylinder—270°

No. 4 to No. 2 cylinder—180°

No. 2 to No. 1 cylinder— 90°

43. SERVICE CHART.—a. Daily service.—

- (1) Check fuel supply—fill tank.
- (2) Check fuel tank air vent. Make sure it is clear.
- (3) Check lubricating oil. Replenish if necessary.
- (4) Wipe off any fuel or oil spilled in filling.
- * (5) Check the air cleaner. Replenish oil if necessary.
- (6) Check all connections. Tighten if necessary.

* NOTE: In dusty locations, wash the air filter in diesel oil and refill with oil daily.

b. Weekly service.—

- (1) Make all checks listed under daily service.
- (2) Remove spark plugs, check for proper gap and clean.
- (3) Check valve adjustment. Readjust if necessary.
- (4) Drain crankcase and refill with clean oil.
- (5) Check all nuts, bolts, screws and other fastenings. Tighten if necessary.
- (6) Remove, clean and refill air cleaner.

c. Monthly service.—

- (1) Make all checks listed under daily and weekly service.
- (2) Check ignition breaker points. Clean and readjust if necessary.
- (3) Remove, clean and replace fuel filter.
- (4) Lubricate all moving control parts.
- (5) Inspect generator commutator. Clean if necessary.
- (6) Inspect generator brushes. Clean or replace if necessary.
- (7) Remove blower housing and air ducts. Clean all air passages and cooling fins.
- (8) Inspect drive belts. Adjust if necessary.
- (9) Check engine compression.

d. Half yearly service.—

- (1) The entire unit should be returned to a depot for general inspection.

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44. STORAGE.—*a. Limited service precautions.—*

(1) When unit is to be shut down for long periods (one or more days), stop it by shutting off the fuel supply instead of using the stop button.

(2) Keep the fuel tank full.

(3) Operate the unit, under load, at least once a week.

b. Prolonged storage.—

(1) When the unit is to remain out of service for prolonged periods, stop the unit as in *a* above.

(2) Disconnect the fuel line and drain the fuel tank.

(3) Remove the spark plugs, pour a small quantity of oil into cylinders through spark plug holes, turn engine over once or twice, replace spark plugs.

(4) Remove old oil from crankcase and air filter.

(5) Plug up exhaust outlet.

(6) Stop up crankcase breather and carburetor air intake.

(7) Coat exposed moving parts with cup grease.

(8) Protect unit from dampness by suitable covering.

c. Removal from storage.—

(1) Remove protective covering.

(2) Remove plug from exhaust outlet.

(3) Remove material used to stop up breather and carburetor air intake.

(4) Thoroughly clean the outside of the unit. Remove all grease used to coat moving parts.

(5) Remove spark plugs and crank unit several times.

(6) Clean spark plugs and replace or install new spark plugs.

(7) Fill crankcase with clean oil.

(8) Fill air cleaner with clean oil.

(9) Fill fuel tank.

(10) Check fuel filter and fuel lines for leaks.

(11) Check all wires and fastenings. Tighten if necessary.

(12) Follow instructions for starting the unit (Paragraph 4, *d*).

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45. TROUBLE CHART—ENGINE.—

<i>Symptom</i>	<i>Cause</i>	<i>Remedy</i>
a. <i>Engine will not start.</i>	(1) Manual start switch in wrong position.	Set switch so arrow points to the right.
	(2) Lack of fuel.	Refill fuel tank.
	(3) Fuel line clogged.	Remove and clean fuel line and filter.
	(4) Foreign matter in fuel.	Clean out fuel system and refill with clean fuel.
	(5) Magneto defective.	See paragraph 18. c.
	(6) Automatic choke defective.	See paragraph 16.
	(7) Ignition short circuited.	Check wiring for short.
	(8) Ignition wire broken.	Check wiring for break.
	(9) Defective fuel pump.	See paragraph 15.
	(10) Governor not working.	See paragraph 17.
b. <i>Engine difficult to start.</i>	(1) See 3, 4, 6 and 10 above.	
	(2) Carburetor clogged.	See paragraph 14. c.
	(3) Air leak in intake manifold.	Check for leak. Replace gasket and tighten.
	(4) Loose cylinder head.	Tighten head.
	(5) Cylinder head gasket defective.	Replace gasket.
	(6) Fouled or defective spark plugs.	Clean or replace plugs.
	(7) Air intake filter clogged.	Clean air filter.
	(8) Muffler clogged.	Replace muffler.
	(9) Valves not seating properly.	See paragraphs 23 and 24.
	(10) Worn piston and/or rings.	See paragraphs 23 and 25.
	(11) Faulty lubrication.	See paragraph 29 and check lubrication.
	(12) Fuel tank vent clogged.	Remove fuel filler cap and blow through vent.
	(13) Breaker points pitted or out of adjustment.	See paragraph 18. f.
c. <i>Engine stops.</i>	(1) Out of fuel.	Fill fuel tank.
	(2) Foreign matter in fuel.	See a, 4 above.
	(3) Ignition wire broken or short circuited.	Check ignition wiring.
	(4) Lack of oil.	If engine stops from lack of oil, notify higher echelon.
	(5) Fuel tank vent clogged.	See b, 12 above.
	(6) Fuel pump defective.	See paragraph 15.
	(7) Fuel line clogged.	See a, 3 above.
	(8) Fuel line broken.	Check fuel line.

NOTICE
IF HARD TO HAND CRANK THIS UNIT,
DISCONNECT MAGNETO GROUND WIRE
AT OIL PRESSURE SWITCH.

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45. TROUBLE CHART—ENGINE.—(Cont.)

<i>Symptom</i>	<i>Cause</i>	<i>Remedy</i>
<i>d. Engine lacks power.</i>	(1) Overload on generator.	Check and reduce load.
	(2) Engine overheated.	Check oil and air passages.
	(3) Improper lubrication.	Check oil and make sure oil pump is working.
	(4) One or more spark plugs fouled or defective.	Clean or replace faulty spark plugs.
	(5) Faulty carburetion.	See paragraph 14.
	(6) Muffler clogged.	Replace muffler.
	(7) Poor compression.	Check for cause. See paragraph 23.
	(8) Improper timing.	See paragraph 18. <i>k</i> .
	(9) Air cleaner clogged.	Remove and clean air cleaner.
<i>e. Engine misfiring.</i>	(1) One or more spark plugs fouled or defective.	Clean or replace faulty spark plugs.
	(2) Magneto breaker points pitted or out of adjustment.	See paragraph 18. <i>f</i> .
	(3) Defective ignition wiring.	Check wiring and correct fault.
	(4) Valves sticking or not seating properly.	See paragraphs 23 and 24.
	(5) Improper fuel mixture.	See paragraph 14.
<i>f. Explosions in carburetor.</i>	(1) Carburetor float level too low.	See paragraph 14. <i>b</i> .
	(2) Fuel line obstructed.	Check fuel line and filter. Remove and clean both.
	(3) Intake valve sticking or not seating properly.	Check valves and correct fault.
	(4) Air leak in intake manifold.	Check for leak and remedy fault.
	(5) Engine out of time.	See paragraph 18. <i>k</i> .
<i>g. Excessive smoke from exhaust.</i>	(1) Lubricating oil too light.	See lubrication chart. Drain and refill with correct oil.
	(2) Choke stuck in closed position.	Check choke and correct fault.
	(3) Carburetor float level too high.	See paragraph 14. <i>b</i> .
	(4) Worn cylinder, piston or piston rings.	Check compression and return unit to higher echelon if compression is poor.

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45. TROUBLE CHART—ENGINE.—(Cont.)

<i>Symptom</i>	<i>Cause</i>	<i>Remedy</i>
	(5) Excessive oil in base.	Check oil and drain any excess.
	(6) Worn connecting rod bearings.	Rock against compression with hand crank and feel for play. Return to higher echelon if bearings seem at fault.
	(7) Carburetor float or float valve sticking.	See paragraph 14. b.
<i>h. Engine knocks.</i>	(1) Lack of oil.	Check oil supply. Replenish with correct oil.
	(2) Engine overheated.	Check generator load, cooling passages, oil supply and ventilation. Correct fault.
	(3) Excessive carbon in cylinders.	See paragraph 30.
	(4) Worn wrist-pin or connecting rod bearings.	See <i>g.</i> 6 above.
	(5) Cylinders and/or pistons and rings worn.	See <i>g.</i> 4 above.
	(6) Loose flywheel.	Remove air shroud and rock flywheel by hand. Play will be apparent. Tighten nut. If fault not corrected, return to higher echelon.
	(7) Ignition timed too early.	See paragraph 18. <i>k.</i>
	(8) Low octane fuel.	Drain fuel and refill with higher octane.
<i>i. Engine overheats.</i>	(1) Cooling air in take obstructed.	Clear any obstruction.
	(2) Lack of ventilation.	Provide better ventilation.
	(3) Cooling fins or air passages clogged or dirty.	Clean fins and air passages.
	(4) Overload on unit.	Check and reduce load.
	(5) Ignition timing late.	See paragraph 18. <i>k.</i>
	(6) Muffler clogged.	Replace muffler.
	(7) Improper lubrication.	Check lubrication. If unable to detect fault, return unit to higher echelon.
	(8) Valve tappets not properly adjusted.	See paragraph 24.
	(9) Choke not opening properly.	Check choke and correct fault.

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46. TROUBLE CHART—GENERATOR.—

<i>Symptom</i>	<i>Cause</i>	<i>Remedy</i>
<i>a. No a-c output.</i>	(1) Commutator dirty.	See paragraph 33. <i>e</i> .
	(2) Brushes not making contact.	See paragraph 33. <i>i</i> .
	(3) Open field coil.	See figure 10.
	(4) Open or shorted armature.	See figure 10.
	(5) Burned out rheostat.	
	(6) Circuit breaker OFF or defective.	Check circuit breaker.
	(7) Broken or loose wires.	Check wiring and correct fault.
	(8) Field wire to resistance unit open or shorted.	Check wiring and correct fault.
<i>b. Low a-c output.</i>	(1) Unit not up to speed.	Check speed of unit and correct.
	(2) Commutator dirty.	See paragraph 33. <i>e</i> .
	(3) Commutator mica high.	See paragraph 33. <i>f</i> .
	(4) Short circuit in power line.	Check power line and correct.
	(5) Brushes not seating.	See paragraph 33. <i>i</i> .
	(6) Field coil grounded.	See figure 10.
	(7) Rheostat not properly adjusted.	Correct adjustment.
	(8) Defective filter condenser.	Check filter and correct fault.
	(9) Generator drive belts slipping.	Check belt tension and adjust.
<i>c. Arcing at brushes.</i>	(1) Commutator dirty.	See paragraph 33. <i>e</i> .
	(2) High mica on commutator.	See paragraph 33. <i>f</i> .
	(3) Brushes not seating properly.	See paragraph 33. <i>i</i> .
<i>d. Interference with radio reception.</i>	(1) Defective filter.	Check condensers in filter. Make necessary replacement.
	(2) Loose electrical connections.	Check and tighten all electrical connections.
	(3) Loose ignition shielding.	Check and tighten all shields.

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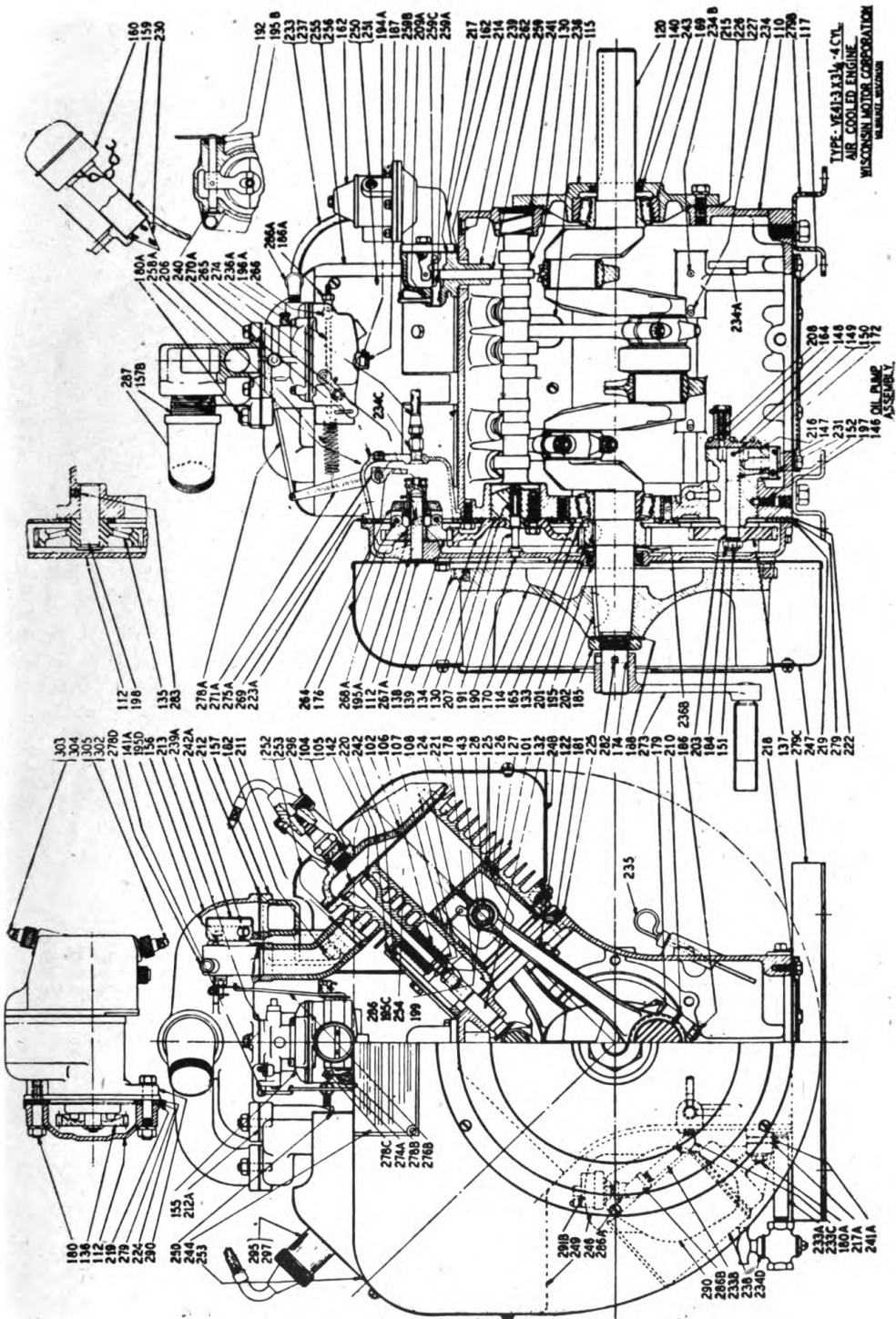


Figure 12.—Power Unit PE-99-B, engine cross section

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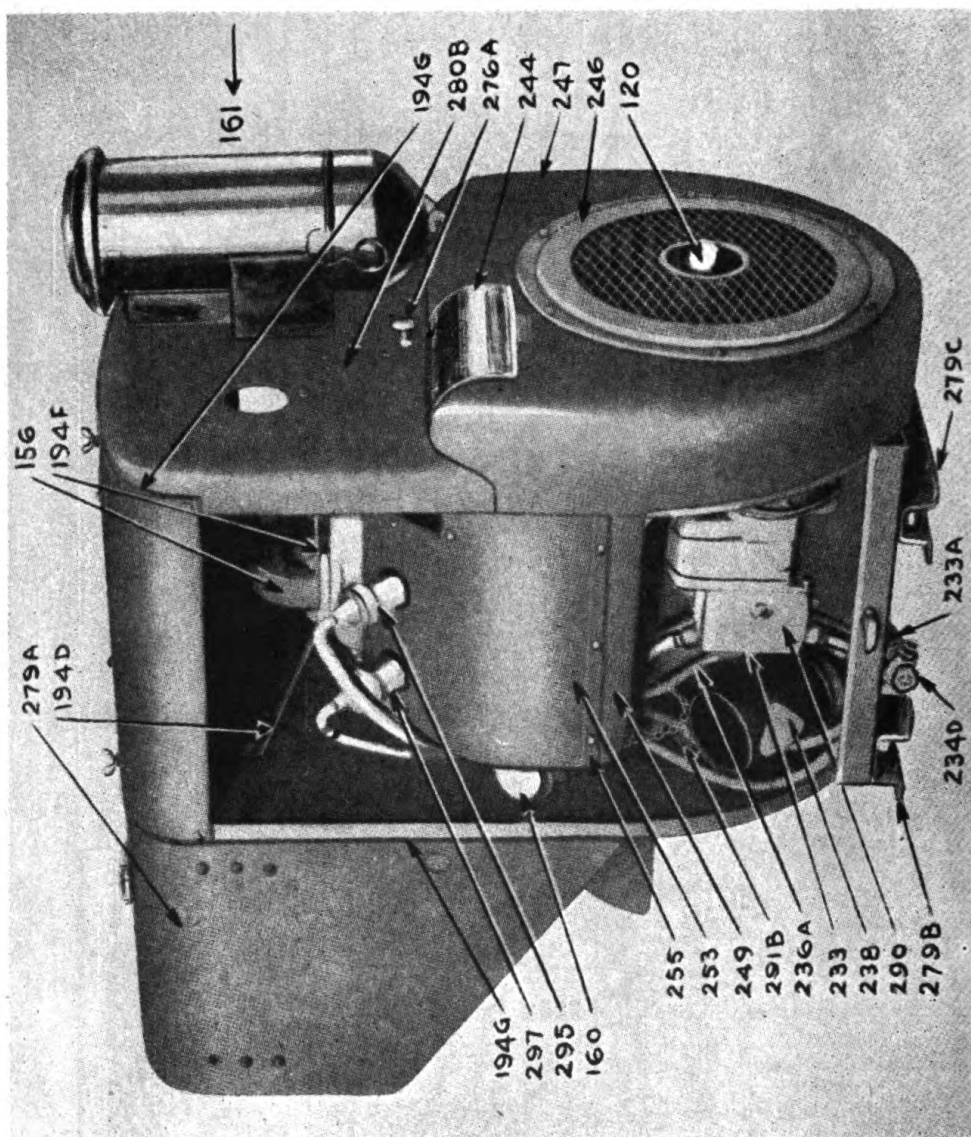


Figure 13.—Engine, magneto-side view

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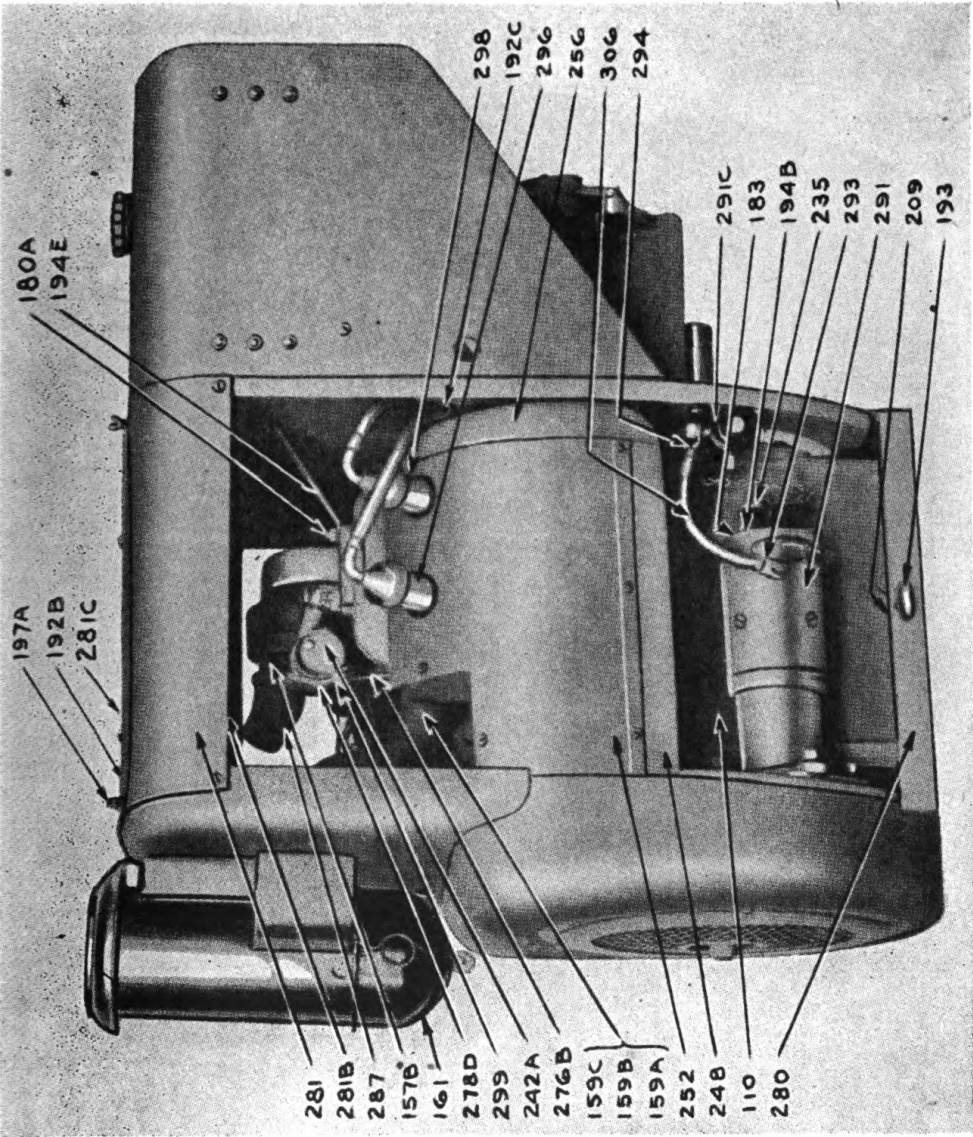


Figure 14.—Engine, starter-side view

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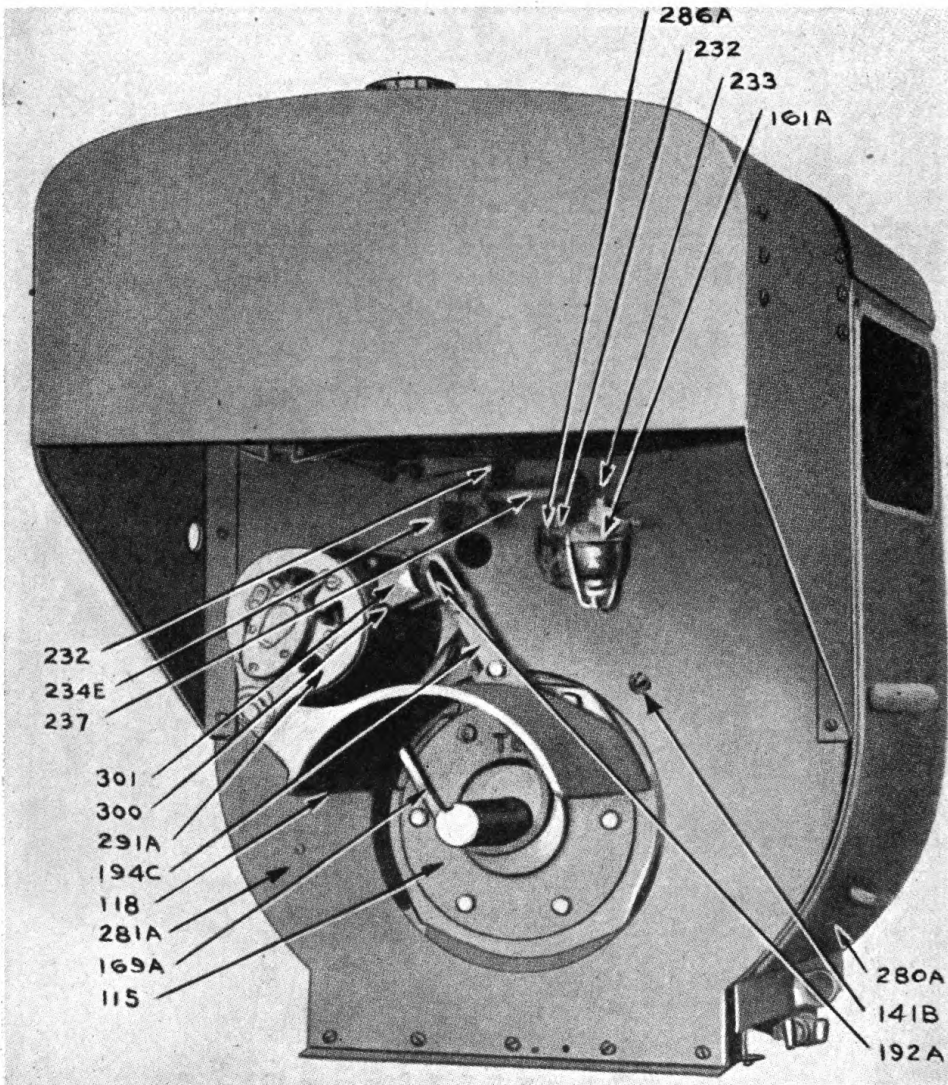


Figure 15.—Engine, power take-off end

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SECTION V—SUPPLEMENTARY DATA

47. TABLE OF REPLACEABLE PARTS.—a. Engine (figures 12, 13, 14 and 15).—

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
		1	Engine, 4 - cylinder, air - cooled V-type	Drives A.C. generator		
101	373460000 3H1924-1	2	Cylinder block with 4 HG-201 inserts pressed in place	House cylinder and part group	AA-85	A
101		2	Cylinder block with studs, inserts, valves, springs, seats, and inspection covers	House cylinder and part group	AA-85-B	A
102	373461300 3H1925-4/H10	2	Cylinder heads	Compressed gas chamber	AB-80-G	A
104	373462800 3H1925-4/L2	4	Valves (exhaust)	To carry off exhaust from gas chamber	AE-75-B	A
105	373462800 3H1925-4/L2	4	Valves (inlet)	To let gas enter compressed chamber	AE-75-B	A
106	373462590 3H1925-4/S40	8	Valve springs	To force valve closed	AF-46	A
107	344954000 3H1909D/S108	8	Valve spring seats	Hold spring in place	AG-26	A
108	373461580 3H1925-4/L20	8 pr.	Valve spring ret. lock (16 halves)	Holds valve spring seat in place	AH-9	A
110	373461580	1	Crankcase with studs, oil filler tube, oil filler screen, plug for oil header, oil header tube, and oil spray nozzles	Housing crankcase part group	BA-48-A-19	A
112		1	Gear cover with camshaft thrust, etc.	Housing camshaft gears	BD-100-C-2	A

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
114		1	Bearing return plate (fan end)	Holds bearing in place	BG-209	A
115		1	Main bearing plate with crankshaft oil seal and ret. (take off end)	Seals crankcase	BG-210	A
117		1	Crankcase bottom cover plate	Hold oil in crankcase	BH-141	A
118		1	Generator support bracket	Support generator	BI-273	A
120	373460690	1	Crankshaft w/main bearings and crankcase gear and key	Crankshaft supp. and lock	CA-55	A
122	3H1925-4/C30	4	Connecting rod with bolts, nuts, shims, and bushings	To connect pistons to crankshaft	DA-51-A	A
124	373462180	4	Pistons—standard—cast iron	To compress gas in compression chamber	DB-199	A
124	3H1925-4/P20	4	Pistons—semi-finished—cast iron	To compress gas in compression chamber	DB-199	A
125	373462100	8	Piston—ring compressor	Used with ref. #124	DC-163	A
126	3H1925-4/R30	4	Piston ring—scraper	Used with ref. #124	DC-163-1	A
127	373462120	4	Piston ring—oil reg.	To prevent lubrication oil from entering compression chamber	DC-109	A
128	3H1925-4/R32	4	Piston pins	Hold piston to connection rod	DE-65	A
130	373460460	1	Camshaft	For operating valves	EA-102	A
132	373462700	8	Valve taper	Adjust valves	FA-40-B	A
133	373461200	1	Crankshaft gear	Drive crankshaft	GA-36-A	A

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
134	373461210	1	Camshaft gear	Used with ref. #133	GB-45-A	A
135	3H1925-4/G71					
135	373461220	1	Idle gear	Used with ref. #133	GC-27-B-1	A
136	3H1925-4/G72					
136	373461230	1	Magneto gear	Drives magneto	GD-98-C	A
137	3H1925-4/G73					
137	373461240	1	Oil pump gear	Drives oil pump	GD-94-A	A
138	3H1925-4/G74					
138	373461250	1	Governor gear	Drives governor	GD-100-A	A
139	3H1925-4/G75					
139		1	Flywheel gear	For starting engine	GH-AA	A
140	373462380	1	Oil seal cork for crankshaft—T.O. end	Seal oil in crankcase	HF-261	A
141a	3H1925-4/55					
141a		1	Spacer for gov. control rod—carb. end	Spacing	HF-381	A
141b						
141b		1	Spacer for supp. rear panel to end	Spacing	HF-380	A
142		8	Valve seat insert	To seat valves	HG-201-B	A
143		4	Piston pin bushing	Forms bearing for piston pin	HG-157-A-S	A
146	373461940	1	Oil pump assembly	Lubrication	K-95-A	A
	3H1925-4/P50					
147		1	Oil pump body	Force lubrication	KA-61-A	A
148		1	Oil pump cover	Used with ref. #147	KB-39	A
149		1	Oil pump gear—driver	Drives oil pump	KC-54-1	A
150		1	Oil pump gear—driven	Used with ref. #149	KC-55-1	A
151		1	Oil pump drive shaft	Drives oil pump	KD-121	A
152		1	Oil pump stub shaft	Used with ref. #151	KD-122	A
155	373460590					
155	3H1925-4/C6	1	Carburetor	Controls fuel	L-45-24	A

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
156		1	Manifold—upper branch	Carries exhaust from compression chamber	LD-227C-1	A
157		2	Manifold—lower branch	Carries gas to compression chamber	LD-228	A
157b		1	Nipple for exhaust	For connection muffler to exhaust manifold	LJ-166	A
159		1	Oil filler tube in crankcase	To carry oil to filter	LJ-300-A	A
159a		1	2 1/2 I.D. hose clamp for air filter connection	To clamp hose to filter	LK-8	A
159b		1	1 7/8 I.D. hose clamp for air filter connection	Used with ref. #159a	LK-11	A
159c		1	Rubber elbow for air filter connection	For filling crankcase with oil	LL-64	A
160	373460540 3H1925-4/C1	1	Oil filler and cap	Filtering oil	LO-60-1	A
161	373460750 3H1925-4/F15	1	United oil bath and filter	Filtering air	LO-66	A
161a	344957000 3H1909-21	1	Fuel strainer	To remove foreign matter	LP-19	A
162	373461950 3H1925-4/P51	1	Fuel pump	To force fuel from tank to carburetor	LP-38-1	A
164		1	Steel ball for oil pump relief valve	Control oil flow	ME-60	A
165		1	Main brg. assembly fan end	Bearing for crankshaft	ME-71	A
169	373460460 3H1925-4/B16	1	Main brg. assembly—T.O. end	Bearing for crankshaft	ME-114	A
169a	373460400 3H1925-4/R10	1	Generator drive belt	To run generator from engine drive shaft	MH-133	A

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
170	373460720	1	Flywheel	Maintain balance	NC-140-1	A
172	3H1925-4/F10	1	Pin for oil pump gear—driven	Hold gear to shaft	PA-64	A
174		1	Pin for starting crank assembly	For crank to turn crankshaft	PA-239	A
176		2	Gov. weight fulcrum pin	Hold governor weight	PA-265	A
177		2	Dowel pin for gear cover to case	To hold gear	PA-291	A
178		8	Valve tapper adj. screw	Adjustment	PE-147	A
179		8	Bolt for conn. rod	To hold connecting rod cap	PB-148	A
180		1	Stud for mag. upper mtg. hole	Mounting magneto	PC-110	A
180a		10	8 studs for mtg. lower to upper manifold	Mounting	PC-112	A
			2 studs for mtg. oil filter			
181		12	Stud for mtg. block to crankcase	Mounting	PC-337	A
182		2	Stud for mtg. block to crankcase	Mounting	PC-369	A
183		2	Stud for mtg. starter bracket	Mounting	PC-396	A
184		1	Special nut for mounting oil pump gear	Mounting	PD-100-1	A
185		1	Special nut for crankshaft	Mounting	PD-123	A
186		8	Connecting rod bolt nut	Mounting	PD-148	A
186a		1	Special nut for gov. adj. screw	Mounting	PD-173a	A
187		1	Everlock washer for carb. air horn drain hole	Mounting	PE-44	A
188		1	Lockwasher for flywheel	Mounting	PE-66	A
190		1	Camshaft thrust plunger button—in gear cover	For adjustment	PF-52	A
191		1	Camshaft and thrust plunger	For adjustment	PF-101	A
192		1	Cup for gov. cross shaft seal	Housing	PF-118	A
192a		1	Cap for gen. terminal housing	Housing	PF-121	A

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
192b		4	Straps for holding insp. cover to canopy	Hold cover	PG-128	A
192c		2	Clips for holding ignition cables	Keep cables in place	PG-206	A
194a		1	Felt washer for carb. air horn drain hole	Cushion	PA-267-1	A
194b		1	Starter support bracket	Brace housing	PG-331	A
194c		1	Generator adjusting strap	For adjusting gen.	PG-391	A
194d		1	House brace—L.H. rear	Used with ref. #194a	PG-394	A
194e		4	House brace—R.H. rear	Cushion	PG-395	A
194f		1	House brace to front panel	Brace panel	PG-421	A
194g		6	Felts for canopy and fuel tank support	To eliminate noise	PH-244a	A
195	373462390 3H1925-4/S6	1	Oil seal for crankshaft—fan end	Hold oil	PH-299	A
195a		1	Gov. dr. gear bush. washer	Keep bushing in place	PH-313-A	A
195b		1	Oil seal for gov. cross shaft	Hold oil	PH-318-A	A
195c		1	Weight on carb. for choke lever	Balance	PH-216	A
195d		2	Special washers for automatic choke	Used with ref. #195c	PH-323	A
196a		1	Adjusting screw for gov.	Adjust speed	PI-115-F	A
197		1	Lockscrew for oil pump	Used with ref. #146	PI-143-a	A
197a		4	Wing nuts for inspection	Hold cover	PI-148	A
198		1	Stud for idler gear	To carry idler gear	PJ-105	A
199		8	Ret. ring for piston pin	Keep piston pin in place	PK-52	A
201		1	Woodruff key for crankshaft gear	Connect gear to crankshaft	PL-53	A
202	373461490 3H1925-4/K10	1	Woodruff key for flywheel	Connect flywheel to crankshaft	PL-83	A
203		1	Woodruff key for oil pump gear	Connect oil pump	P-137	A

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
206		1	Governor spring	Control tension on governor lever	PM-76	A
207		1	Camshaft thrust plunger spring	Tension on camshaft plunger	PM-108	A
208		1	Relief valve spring for oil pump	Tension on relief valve	PM-111	A
209		2	Spring for door clip	To hold door tight	PM-137	A
210		8	Connecting rod shim	For adjusting conn. rod bearing	PM-145	A
211	373460850	6	Gasket for inlet and exhaust manifold port	Seals exhaust conn.	QB-75	A
212	3H1925-4/S33	2	Gasket for inlet manifold upper to lower branch	Seals exhaust conn.	QB-78	A
212a	373460860	2	Gasket for man. upper to lower branch	Seals manifold conn.	QB-79	A
213	3H1925-4/GB	1	Gasket for mounting carb.	Seals carb. conn.	QC-58	A
214	373460890	1	Gasket for fuel pump adaptor	Seals connection	QD-67	A
215	3H1925-4/G16	2	Gasket for main bearing plate—T.O. end	Seals main bearing plate take off end	QD-527a	A
216	373460930	1	Gasket for oil pump cover	Seals connection of cover	QD-535	A
217	373460940	1	Gasket for mounting fuel pump	Seals fuel pump at mounting	QD-538-a	A
217a	3H1925-4/G20	2	Gasket for oil filter	Seals connection oil filter	QD-595-a	A
218	373460960	1	Gasket for crankcase bottom cover plate	Seals cover plate	QD-610-a	AA
219	3H1925-4/G22	1	Gasket for gear cover	Seals gear cover	QD-111	A

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
220	373460990 3H1925-4/G24	4	Gasket for valve inspection cover	Seals valve inspection cover	QD-612-a	A
221	373460850 3H1925-4/S33	2	Gasket for cylinder head	Seals connection of cylinder head	QD-613-B	A
222	373461000 3H1925-4/G25	1	Gasket for gear cover spacer	Seals connection	QD-614	A
223a	373461010 3H1925-4/G26	1	Gasket for governor housing	Seals connection	QD-615-A	A
224	347754000 3H2699-21/G1	1	Gasket for magneto	Seals connection	QD-616	A
225	373461020 3H1925-4/G27	2	Gasket for cylinder base	Seals connection	QD-617	A
226		2	Shim for main brg. plate—T.O. To adjust bearing end—.006" thick	To adjust bearing	QF-33	A
227		2	Shim for main brg. plate—T.O. To adjust bearing end—.003" thick	To adjust bearing	QF-33-a	A
230	373462430 3H1925-4/S10	1	Oil filler screen	Screen oil	RC-91	A
231	373461940 3H1925-4/850	1	Oil pump screen	Screen oil	RD-119	A
232		2	1/8" pipe nipple 1—in street ell at pump inlet 1—in fuel tank	Connect fuel lines	RF-794	A
233a		1	Nipple for oil drain	Connection of oil line	RF-1139	A
233b		1	Nipple for oil pressure gauge	Connection gauge to pressure line	RF-902	A
233c		1	45" street ell in case for oil pressure gauge	Connection gauge to pressure line	RF-1096	A
234		2	Long nozzle	Connecting pressure line	RF-1121	A

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
234a		1	Stand pipe for oil filter drain hole	To carry oil to filter	RF-1128	A
234b		2	Short nozzle	Connecting gauge	RF-1143	A
234c		1	Oil line fitting in gov. housing	Connecting oil line to governor	RF-1165	A
234d		1	Oil drain cock	For draining oil from crankcase	RG-28a	A
234e		1	3-way cock for fuel line	For connection to unit gas tank and auxiliary tank	RG-36	A
235	373460800 3H1925-4/G1	1	Oil level gauge with PH-245 cork	Record oil level	RJ-143	A
236		2	Crankcase splash plate	Lubrication	RK-167	A
236a		1	Oil line case to gov.	Carry oil	RM-1049e	A
236b		1	Crankshaft oil sling	To strain fuel	PK-170	A
237		2	Fuel line pump to carb. filter to pump	Carry fuel from pump to carb.	RM-1049a	A
238	373460755 3H1925-4/F16	1	Oil filter	Filter Oil	RV-27-a	A
239	344903000 3H1909-D/P217	2	Welch plug in crankcase for cam-shaft bearing oil holes	For oiling camshaft bearing	SA-26	A
239a		1	Cover for automatic choke shield-ing	Protects terminals	SA-28	A
240	373461820 3H1925-4/P15	1	Welch plug in gov. housing	For oiling gov. bearing	SA-52	A
241	373461830 3H1925-4/P16	1	Welch plug for camshaft end hole	For oiling camshaft bearing	SA-58	A
241a		1	Spacer for oil filter	Spacing	SA-65a-2	A
242	373446180 3H1925-4/P10	4	Valve insp. cover plate	To keep valves clean	SA-68	A
242a		1	Cup for automatic choke shielding	Protects connections	SA-73	A

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
243	373462040 3H1925-4/R10	1	Oil seat ret. for crankshaft—T.O. end	Ret. oil at bearing	SD-43	A
244		1	Name and instruction plate	Instructions	SD-115-C	A
246		1	Flywheel screen	To permit air to reach fan	SE-20-G-3	A
247		1	Flywheel shroud	Flywheel guard	SE-74-E	A
248		1	Lower cyl. shroud R. H. side	To cover flywheel	SE-75-B	A
249		1	Lower cyl. shroud L. H. side	To cover flywheel	SE-76-b-1	A
250		1	Cyl. heat deflector L. H. side	For cooling cylinder	SE-77-A	A
251		1	Cyl. heat deflector R. H. side	For cooling cylinder	SE-77-B	A
252		1	Cyl. head shroud R. H. side	To cover cylinder	SE-78-A	A
253		1	Cyl. head shroud L. H. side	To cover cylinder head	SE-79-A	A
254		1	Side cover for air shroud	Protect air shroud	SE-80	A
255		1	Rear shroud cover—L. H. side	Protection of air shroud	SE-82-B	A
256		1	Rear shroud cover—R. H. side	Protection of air shroud	SE-83-B	A
258a	373461300 3H1925-4/G70	1	Governor assembly	To govern speed of engine	T-89-2	A
259		1	Fuel pump plunger	Forces fuel to pump chamber	TA-111-1	A
259a		1	Fuel pump primer shaft	To drive pump	TA-114	A
259b		1	Handle for fuel pump	Control	TA-115	A
259c		1	Fuel pump plunger cap	Operation	TA-116	A
262		1	Fuel pump adaptor	Holds fuel pump plunger	TB-105-B	A
264		2	Gov. flyweight	For balance	TC-322-A	A
265		2	Gov. flyweight thrust pin	Holds flywheel on crankshaft	TC-328	A
266		1	Pin for gov. adj. screw	To hold governor adjustment screw	TC-367	A
267a		1	Gov. drive shaft	To drive governor	TC-388-1	A
268a		1	Gov. drive gear bushing	Bearing	TC-389-1	A

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
269		1	Gov. thrust sleeve and bearing assembly	Bearing for gov.	TC-391	A
270a		1	Gov. housing	Housing	TC-395	A
271a		1	Gov. cross shaft and lever assembly	For operating gov.	TC-398	A
273	3734606860 3H1925-4/C25	1	Starting crank assembly	Hand cranking	U-212	A
274		1	Choke lever	Control flow of air and gas to carb.	VB-147	A
275a		1	Manual lever for automatic choke	Hold governor lever	VB-158	A
276a		1	Carb. choke control	Manual choke	VE-435-1	A
276b		1	Automatic choke control rod	Connects choke control to carburetor	VE-446	A
278a		1	Governor control rod	Connects governor lever to carb.	VE-464	A
278b		1	Wire conn. on choke lever	To hold wire	VE-509	A
278c		1	Spacer for choke lever	Spacing	VE-510	A
278d		1	12-volt auto. choke	To enrich fuel when starting engine	VE-511A	A
279		1	Spacer between crankcase and gear cover	To enrich fuel for starting engine	WE-182-a	A
279a	37346250 3H1925-4/T1	1	Fuel tank with supports	To hold fuel	WE-192D-3	A
279b		1	Fuel tank cap	For filling tank	RC-92	A
279c		1	Engine support—rear	Support engine	WE-193-A	A
280		2	Engine support—front	Support engine	WE-194-A	A
280a		2	Side rails	Holding door lock	WE-195	A
280b		2	Side panels removable	For inspection	WE-196	A
280b		1	Front panel	For inspection	WE-197-16	A

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
281		1	Canopy	Housing gas tank	WE-198A-4	A
281a		1	Rear panel	Housing	WE-199A-10	A
281b		1	Partition plate	Supports engine	WE-218A	A
281c		1	Insp. cover for canopy	Inspection	WE-227-A	A
282		1	Headless set screw for starting pin	Holds starting pin in place	XE-17	A
283		1	Set screw for mounting idler stud in case	Holds idler gear in place	XE-55	A
286		1	Rivet for choke weight	To fasten choke weight	XJ-34	A
286a		3	1/8" street ell	Used in oil pump line	XK-38	A
		1	for fuel pump inlet	Used in oil pump line		
		1	in carburetor	Connect gas line		
		1	for oil pressure gauge	Connect oil line to pressure gauge		
286b		1	Elbow for oil pressure gauge	Connect oil line to pressure gauge	XK-44	A
287		1	Street ell for exhaust muffler	Connecting muffler	XK-94	A
290	373700400	1	Fairbanks-Morse W/gear and bushing	Dries magneto	Y-41-B	A
291	3H2699-21 348448900 3H3114-6	1	Autolite 12-volt starter	For starting engine	YA-7	A
291a		1	Autolite 12-volt generator	Charging batteries	YB-19A	A
291b		1	Oil pressure switch	To stop engine when oil gets too low in crankcase	YC-11A	A
291c	345315066 3H1925-1/550	1	Solenoid starting switch	For starting engine	YC-20	A
293		1	Terminal for starter	Connection	YD-26A	A
294		1	Terminal for solenoid switch	Connection	YD-26B	A
295	373462500 3H1925-4/S30	1	Titeflex spark plug shielding for No. 1 cylinder	Shielding	YD-49A	A

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
296	373462510	1	Titeflex spark plug shielding for No. 2 cylinder	Shielding	YD-49D	A
297	3H1925-4/S32	1	Titeflex spark plug shielding for No. 3 cylinder	Shielding	YD-49A	A
298	3H1925-4/S32	1	Titeflex spark plug shielding for No. 4 cylinder	Shielding	YD-49F	A
299	373462530	1	Connector for loom on choke shield- ing cup	Connection	YD-51	A
300	3H1925-4/S33	2	Grommet for gen. term. housing	Insulation	YD-C1-1	A
301		2	Grommet for term. housing assem- bly	Insulation	YD-64	A
302		1	Spark plug cable for No. 1 cyl.	Carry spark from distributor to spark plug	YL-64	A
303			Spark plug cable for No. 2 cyl.	Carry spark from distributor to spark plug	YL-65	A
304			Spark plug cable for No. 3 cyl.	Carry spark from distributor to spark plug	YL-66	A
305			Spark plug cable for No. 4 cyl.	Carry spark from distributor to spark plug	YL-67	A
306		1	No. 4 A.W.G. cable 6" long starter to switch	Carry current from switch to 1 piece starter		A
	346829996	1	Autolite voltage reg.	Regulate voltage	YJ-13	A
	3H2411-11/R25	1	Spark plug wrench	For installing and removing spark plugs	DF-48	A

POWER UNIT PE-99-B

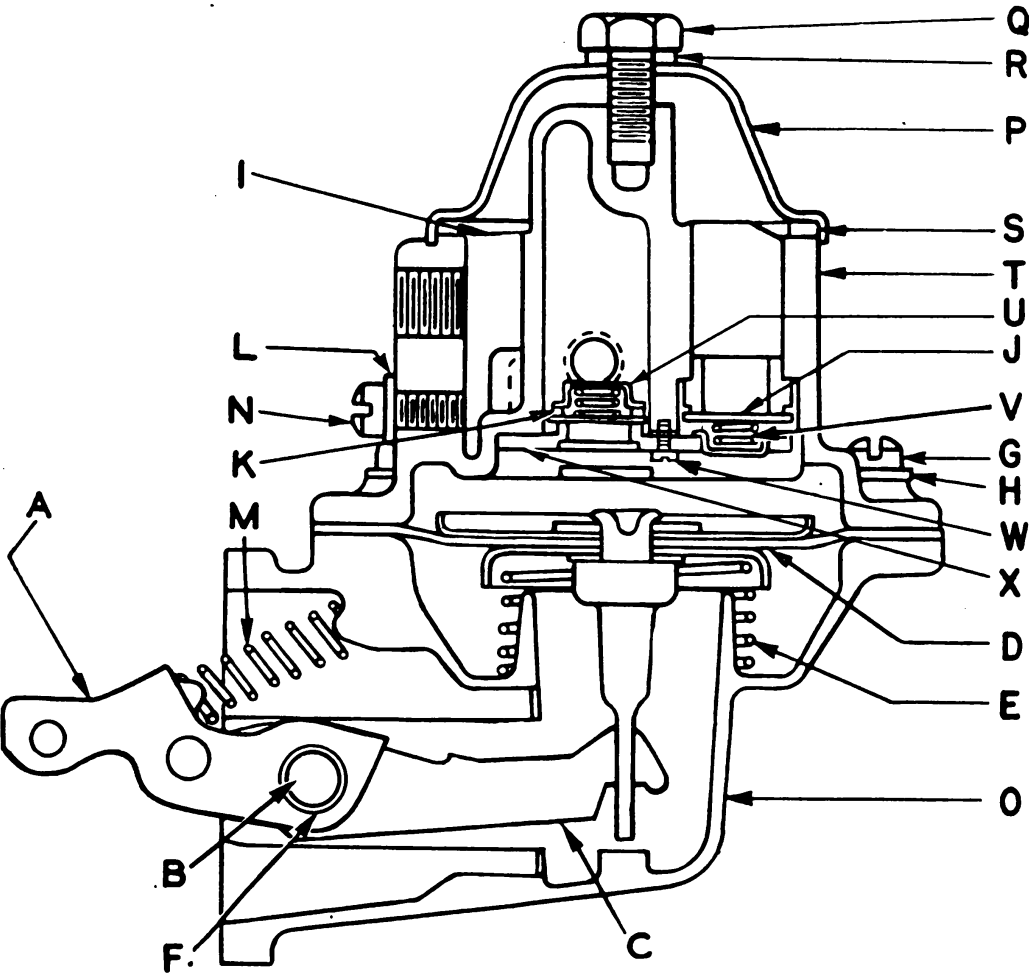


Figure 16.—Fuel pump cross section

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>b. Fuel pump (figure 16).—</i>						
A	1	1	Rocker arm	Lever	A1521862	K
B	1	1	Rocker arm pin	Hold rocker arm link	B1521640	K
C	1	1	Link	Hold rocker arm	1521863	K
D	1	1	Diaphragm assembly	Pump fuel	1523301	K
E	1	1	Diaphragm spring	Open diaphragm	1523714	K
F	1	1	Rocker arm pin bushing	Bearing	1541864	K
G	6	6	Cover screws	Hold cover	855493	K
H	6	6	Cover screw lockwasher	Lock cover screw	855064	K
I	1	1	Screen	To remove foreign matter	1521479	K
J	2	2	Valves	Intake valve	855279	K
K	1	1	Valve plate gasket	To prevent leakage	1521472	K
L	1	1	Drain screw gasket	To prevent leakage	851297	K
M	1	1	Rocker arm spring	To put tension on rocker arm	1522091	K
N	1	1	Drain screw	To drain fuel chamber	1521612	K
O	1	1	Body	Housing	1523258	K
P	1	1	Cover plate	To cover fuel chamber	1521475	K
Q	1	1	Cover plate cap screw	To hold cover	1537148	K
R	1	1	Cover plate cap screw gasket	To prevent leakage	1521476	K
S	1	1	Cover plate gasket	To prevent leakage	1521480	K
T	1	1	Cover and valve seat assembly	Housing	1521641	K
U	1	1	Outlet valve spring	To close valve	1521473	K
V	2	2	Valve spring	To close valve	856270	K
W	3	3	Valve retainer screw	To hold valve retainers in place	856374	K

POWER UNIT PE-99-B

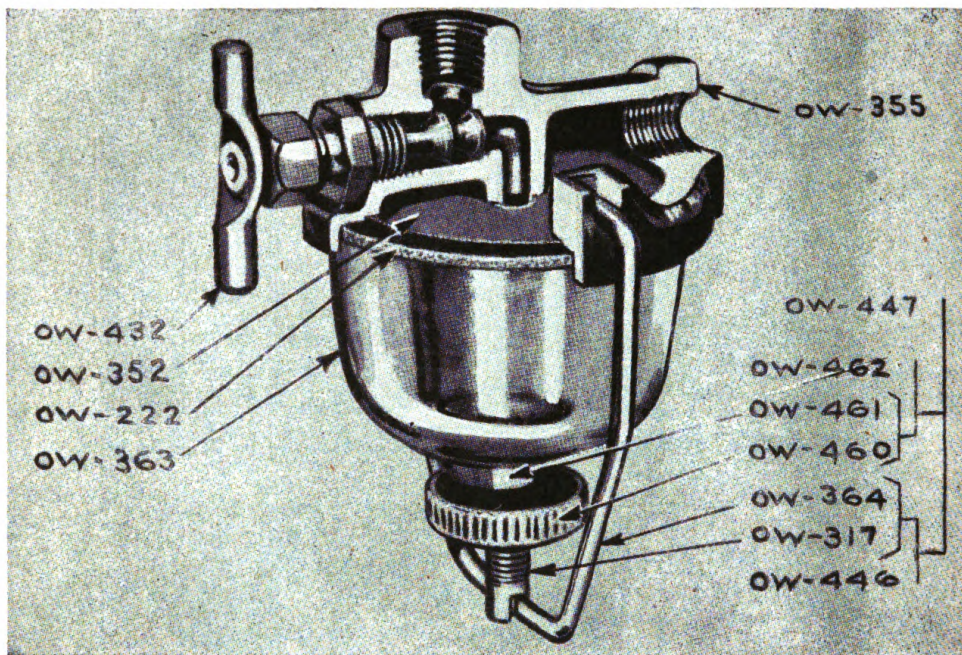


Figure 17.—Fuel filter

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>c. Fuel filter (figure 17).—</i>						
OW-462	1	Thumb nut and clamp cup assy. consisting of:	Hold fuel		OW-462	H
OW-460	1	Thumb nut	Hold clamp wire in place		OW-460	H
OW-461	1	Clamp cup	Hold thumb nut & gasket in place		OW-461	H
OW-446	1	Clamp cup stud and clamp wire assembly consisting of:	Hold cup assembly in place		OW-446	H
OW-317	1	Clamp cup stud	To carry clamp cup nut .		OW-317	H
OW-364	1	Clamp wire	To hold clamp cup assembly to strainer cover main body		OW-364	H
OW-432	1	Shut-off cock	To stop flow of fuel when cleaning strainer		OW-432	H
OW-361	1	Strainer cover (main body)	Support all parts		OW-361	H
OW-222	1	Gasket	To prevent leakage		OW-222	H
OW-352	1	Strainer screen	Remove foreign matter		OW-352	H
OW-352	1	Strainer bowl	Reservoir		OW-352	H

POWER UNIT PE-99-B

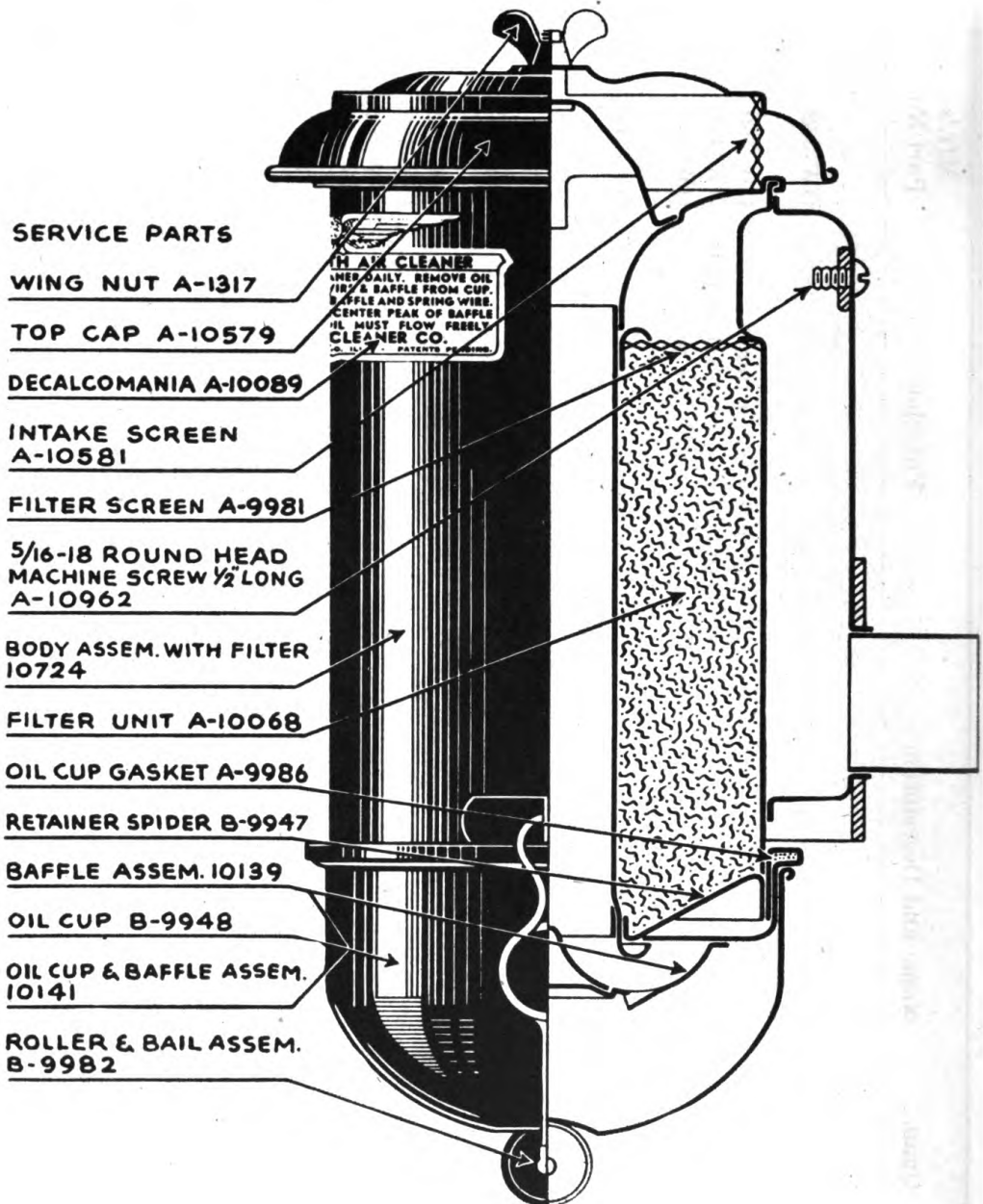


Figure 18.—Air cleaner cross section

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>d. Air cleaner (figure 18).—</i>						
A-1317		1	Wing nut	To hold cap in place	A-1317	A
A-10579		1	Top can	Protection	A-10579	A
A-10089		1	Decalcomania	Instructions	A-10089	A
A-10581		1	Intake screen	To prevent foreign matter from entering cleaner	A-10581	A
A-9981		1	Filter screen	Clean air	A-9981	A
A-10962		5	5/16-18 round head machine screws 1/2" long	Mounting	A-10962	A
A-10724		1	Body assembly with filter	Housing	A-10724	A
A-10068		1	Filter unit (4 balls)	Clean air	A-10068	A
A-9986		1	Oil cup gasket	To seal	A-9986	A
A-10128		1	Retainer spider	Hold filter unit	A-10128	A
A-10139		1	Baffle assembly	Baffle air	A-10139	A
B-9948		1	Oil cup	Oil bath	B-9948	A
10141		1	Oil cup and baffle assembly	Cleaning air	10141	A
B-9982		1	Roller and bail assembly	To hold oil cup and baffle assembly	B-9982	A

POWER UNIT PE-99-B

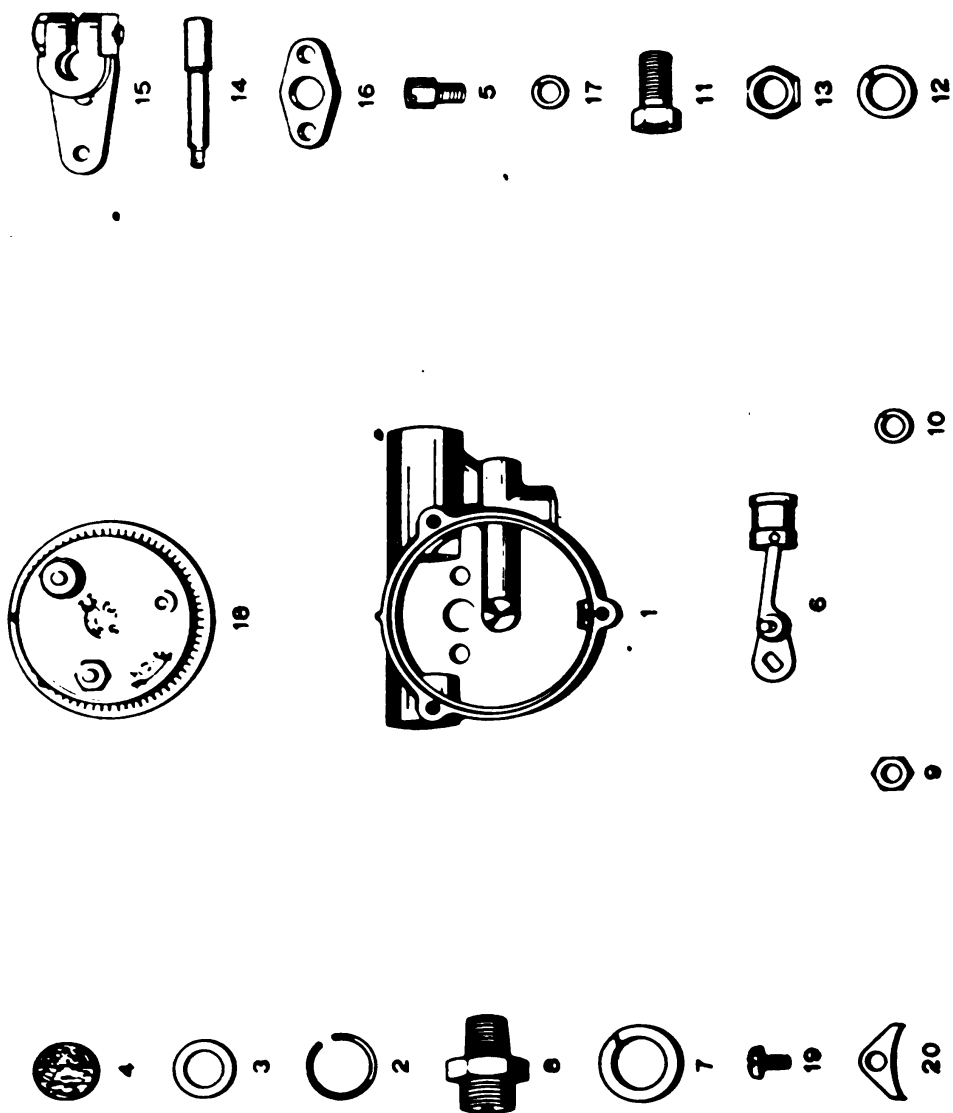


Figure 19.—Automatic choke disassembled

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>e. Automatic choke (figure 19).—</i>						
1			Choke housing	Housing	382770	A
2			Felt strainer and washer clip	To hold washer and strainer strip	382777	A
3			Felt strainer washer	To hold strainer	P-207444	A
4			Felt strainer	Straining air	382776	A
5			Vacuum piston lever stop screw	To stop lever	382774	A
6			Vacuum piston and link	Creates vacuum	P-24133	A
7			Vacuum line union lockwasher	To lock union connection tight	382779	A
8			Vacuum line union	To connect line to automatic choke	382778	A
9			Vacuum piston lever nut	To hold lever	P-16571	A
10			Vacuum piston lever nut lockwasher	Used with ref. No. 9	P-15875	A
11			Choke lever stem bushing	To connect choke lever	382772	A
12			Choke lever stem bushing locknut lockwasher	Used with ref. No. 11	P-8338	A
13			Choke stem bushing nut	To hold choke lever on bushing	382773	A
14			Choke stem	Control choke	382771	A
15			Choke lever	Used with ref. No. 14	P-20229	A
16			Stop screw plate	To hold stop lever	382775	A
17			Stop screw lockwasher	Used with ref. No. 16	40-S-19	A
18			Assembly thermostat unit	For automatic operation of choke	382780	A
19			Thermostat unit attach screw	Used with ref. No. 18	P-24179	A
20			Thermostat unit attach screw washer	Used with ref. No. 18	P-24179	A

POWER UNIT PE-99-B

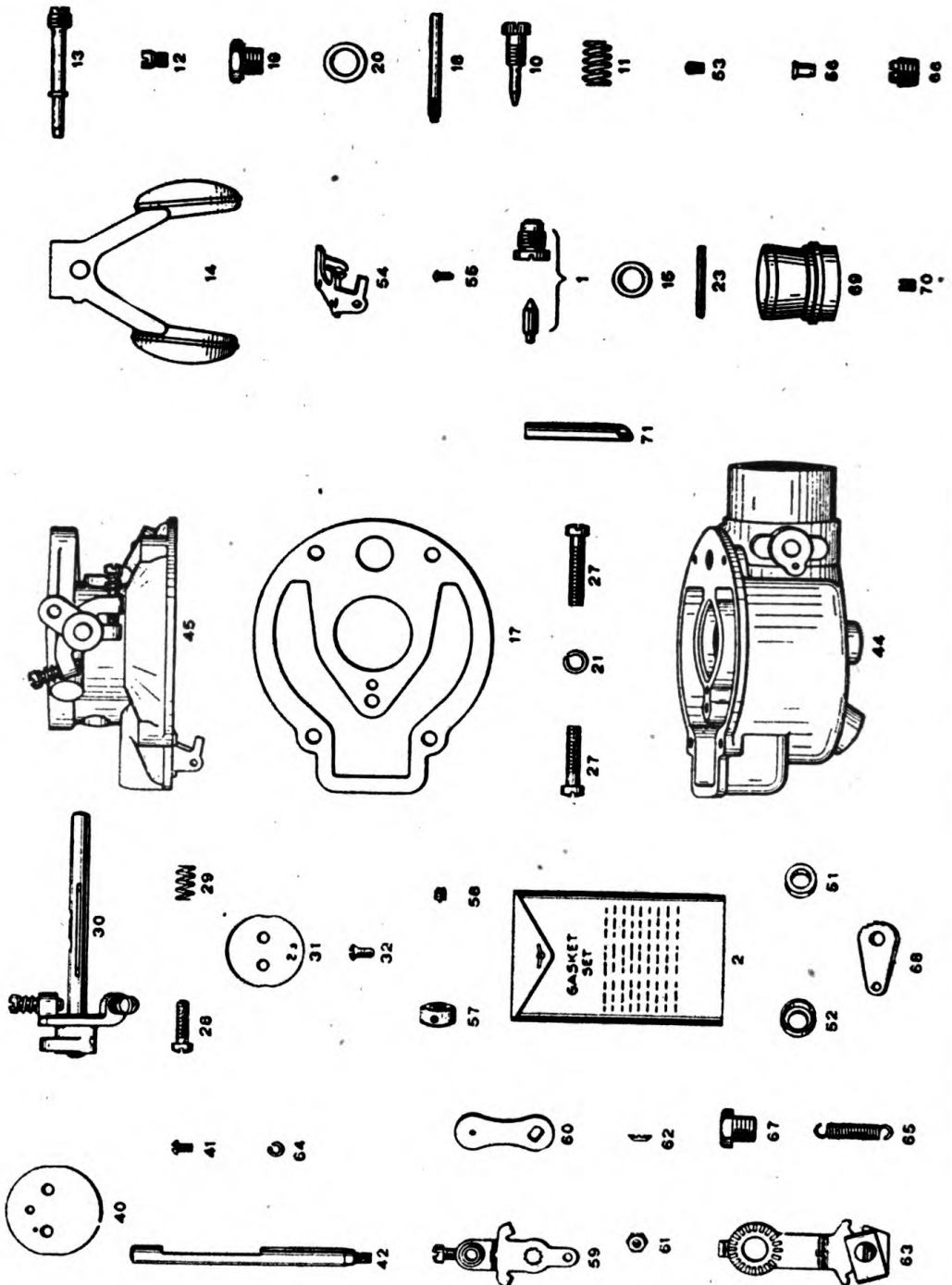


Figure 20.—Carburetor disassembled

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>f. Carburetor (figure 20).—</i>						
1		1	Float needle valve and seat	To control amount gas in float chamber	425173	E
2			Complete set of gaskets	To seal assembled parts	382391	E
10		1	Idle needle valve	Control flow of gas from feed line	P-15396	E
11		1	Spring—idle needle valve	To hold valve when properly adjusted	P-12530	E
12		1	Metering jet	Control of fuel in float chamber	P-18921	E
13		1	Main discharge jet No. 48	To drain surplus fuel	P-18340	E
14		1	Float assembly	Control gas	425106	E
15		1	Gasket—float needle valve seat	Used with ref. No. 1	425176	E
17		1	Gasket—main body	To seal throttle body to main body	425122	E
18		1	Idle tube, No. 74	Used with ref. No. 1	425123	E
20		1	Gasket—main discharge plug	To seal discharge plug to gasket main body	P-11572	E
21		4	Lockwasher — main body attach. screw	Used with ref. No. 27	40-S-49	E
23		1	Fulcrum pin—float	Used with ref. Nos. 45 and 14	425162	E
27		4	Screw—main body attach. (short)	To fasten main body to throttle body	177S-44	E
28		1	Screw—throttle stop	For adjusting throttle	P-23474	E
29		1	Spring-throttle stop screw	Used with ref. No. 28	P-15301	E
30		1	Throttle lever and shaft	Operation of carburetor	425120	E
31		1	Throttle valve	Used with ref. No. 45	425111	E
32		1	Screw—throttle valve attach.	To attach valve to throttle	425161	E
40		1	Choke valve	To choke carburetor	425112	E
41		1	Screw—choke valve attach.	To hold choke valve	425201	E
42		1	Choke stem and lever	To operate choke	425156	E

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
44		1	Main body	Housing	425178	E
45		1	Throttle body (complete with idler holes, throttle stem and valve) No. 60 and No. 68 idler holes	To make starting of engine easier	425260	E
51		1	Felt packing	To retain fuel	425157	E
52		1	Retainer—felt packing	To hold retainer felt	425158	E
53		1	Channel plug	For draining channel	425160	E
54		1	Float hanger	For float to operation	425159	E
55		1	Drive screw—float hanger	Hold float to hanger	253-S-22	E
56		1	Channel plug	For cleaning channel	P-15459	E
57		1	Collar—throttle stem	Used with ref. No. 42	P-17081	E
58		1	Set screw—throttle stem collar	To hold throttle stem collar	P-16161	E
60		1	Choke lever	Control choke	425130	E
61		1	Nut—choke lever attach. 40-S-49 lockwasher—choke lever attach. nut	To hold choke lever	40-S-49	E
64		1	Lockwasher—choke valve attach. screw	Used with ref. No. 61	425202	E
66		1	Pipe plug	To seal pipe	P-3292	E
69		1	Venturi 13/16	Ventilation	425104	E
70		1	High speed bleeder No. 70	To bleed the mixing chamber at high speed	P-20242	E
71		1	Vent tube	Ventilation	425163	E
72		1	Main discharge jet gasket	To seal discharge jet	P-9600	E

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>g. Low voltage charging generator (figure 21).—</i>						
		1	Frame and field assembly	Hold generator field and parts	GEF-2001	C
		1	Washer, ins., arm. term. (17/64 x 3/4 x .062)	Insulates armature terminal	GAA-32	C
		1	Ins., field, connection	Used with GAA-32	GAL-44	C
		1	Washer, ins., field term. (13/64 x 9/16 x 1/16)	Used with GAA-32	GBW-34	C
		1	Bushing, ins., arm. term. (.250 x .3152 x 5/16)	Used with GAA-32	OCT-25	C
		1	Bushing, ins., field term. (.203 x .305 x 5/16)	Used with GAA-32	GCY-25	C
		2	Pole piece	Holds field coils	GDZ-29	C
		1	Ins., term. post, inner	Used with GDZ-29	GEA-34	C
		1	Coil assy., field, comp.	Generates current	GEF-1005	C
		1	Post, terminal, field No. 10-32	To connect field terminals	GEW-58	C
		1	Post, arm. term., No. 14-24	To connect armature terminals	GEA-27	C
		1	Lead assembly	To carry current from brush to field term.	GEA-30	C
		1	Terminal	To connect field term. to brush	X-847	C
		1	Coil, field, left	Generate current	GEF-1007	C
		1	Coil, field, right	Generate current	GEF-1008	C
		2	Screw, pole piece	Hold field poles	GK-38	C
		2	Pin, dowel, 1/8 x 7/16	Hold head assembly in place	MN-21	C
		1	Nut, hex., No. 14-24	Holds terminals on com. post	8X-177	C
		1	Washer, lock, No. 14	Used with ref. No. GY-20	12X-193	C
		1	Washer, lock, No. 10	Used with ref. No. GY-20	12X-196	C
		1	Washer, plain, No. 10	Used with ref. No. GB-34	8Y-349	C
		1	Washer, plain, 1/4	Used with ref. No. 8X-177	8X-361	C

POWER UNIT PE-99-B

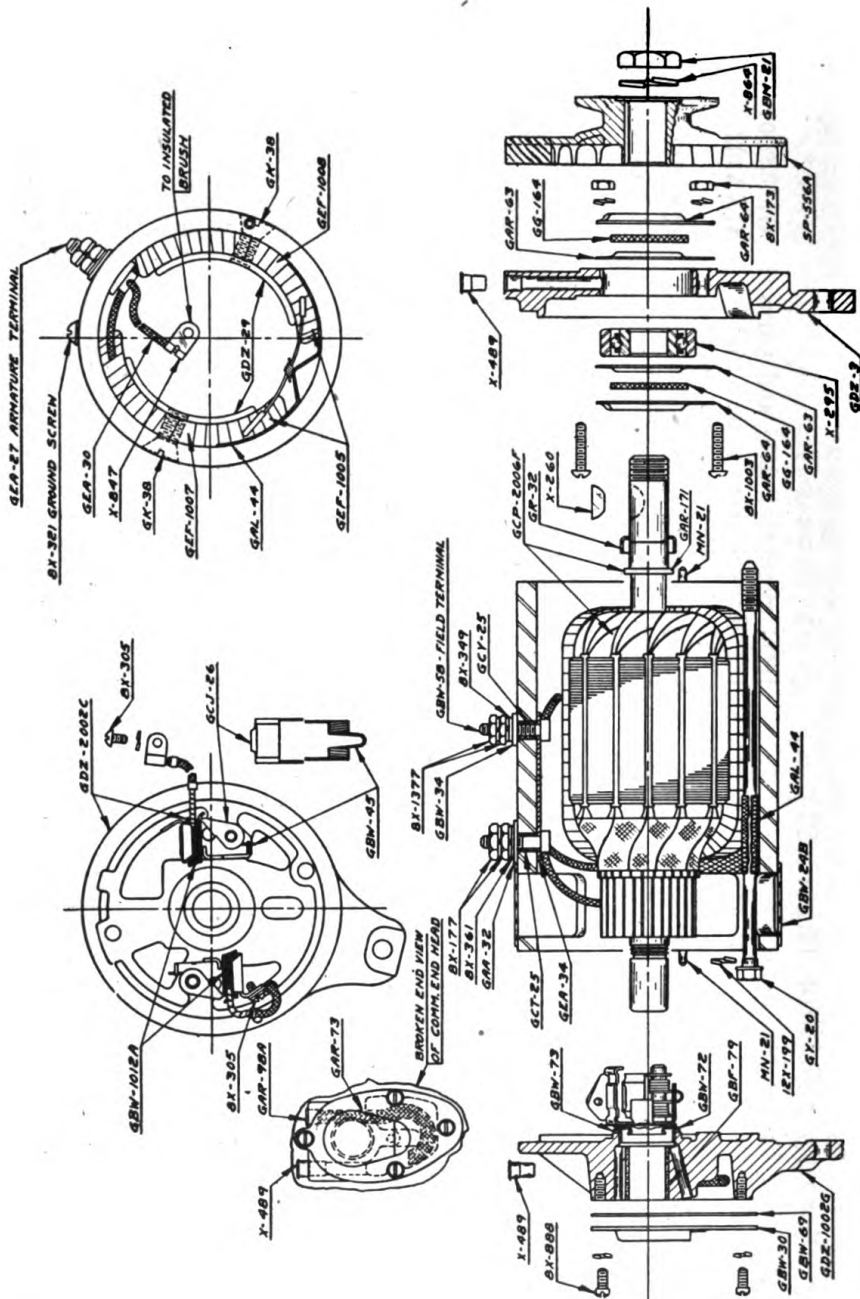


Figure 21.—Low voltage charging generator

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
		1	Nut, hex., No. 10-32	Hold wires on field terminal	8X-1377	C
		2	Screws, frame	Hold wires on field terminal	GY-20	C
		1	Nut, hex., No. 14-24	Holds housing together	8X-177	C
		1	Washer, lock, No. 14	Used with ref. No. 8X-177	12X-193	C
		2	Washer, lock, No. 10	Used with ref. No. 8X-177	12X-196	C
		2	Washer, lock, $\frac{1}{4}$	Used with ref. No. 8X-177	12X-199	C
		1	Screw, rd. hd., No. 10-32 x 5/16	Holds comm. brush cable clamp	8X-321	C
		1	Nut, hex., No. 10-32	Used with ref. No. 8X-321	8X-1377	C
		1	Head assembly, comm. end	Generates current	GDZ-2002C	C
		1	Wick, felt ($\frac{1}{4}$ x $2\frac{1}{4}$)	To prevent oil from entering comm. end bearing	GAR-73	C
		1	Cover wick	Hold oil	GAR-98A	C
		1	Cover comm. end	Housing	GBW-30B	C
		1	Gasket, comm. end cover	Seal comm. end	GBW-69	C
		1	Oil guard	Hold oil	GBW-72	C
		1	Gasket, oil retaining	Seal	GBW-73	C
		2	Brushes	Generate current	GBW-1012A	C
346828991						
3H2411-11/B10						
		1	Head assembly, partial comm. end	Hold comm. head assy. parts	GDZ-1002G	C
		2	Springs, brush	Keep tension brushes	GBW-45	C
346828994		1	Brg., absorbent bronze	To carry drive shaft	GBF-79	C
3H2411-11/B30						
		2	Arm., brush	Generate current	GCJ-26	C
		5	Washer, lock, No. 8	Used with ref. No. 8X-888	X-195	C
		1	Screw, rd. hd., No. 8—32 x $\frac{1}{4}$	Used to hold terminal lug	8X-305	C
		1	Oiler, press-in type, $\frac{1}{4}$	Oiling bearings	X-289	C
		4	Screws, fill, hd., No. 8—32 x 5/16	Hold comm. end plate	8X-888	C
		1	Washer, lock, No. 8	Used with ref. No. 8X-888	X-195	C

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
		1	Screw, rd. hd., No. 8—32 x $\frac{1}{4}$	Hold terminal lugs	8X-305	C
		1	Nut, Armature shaft (hex., .699-20)	Hold armature in place on drive shaft		
		1	Armature assembly	Generate current	GBM-21	C
		1	Snap ring	Used to hold armature assembly	GCP-2006F	C
		1	Retainer, felt washer	Used with ref. No. GAR-171	GAR-171	C
	346828996	1	Pulley drive	To drive generator	GR-32	C
	3H2411-11/P15				SP-556A	C
		1	Key, Woodruff, No. 5	Hold pulley to shaft	X-260	C
		1	Washer, lock, .669	Lock pulley in place	X-884	C
		1	Head assy., drive end	Hold head assembly parts	GDZ-1003	C
		2	Retainers, felt washer	Retain oil	GAR-63	C
		2	Retainers, bearing	Hold bearing in place	GAR-64	C
		1	Head	Housing	GDZ-3	C
		2	Washer, felt ($\frac{7}{8}$ -1-5/16 x $\frac{1}{8}$)	Retain oil	GG-164	C
		3	Nuts, hex., No. 10—32	Used with ref. No. 8X-1003	8X-173	C
		3	Washers, lock, No. 10	Used with ref. No. 8X-1003	X-196	C
	362045000	1	Brg., ball, S.A.E. No. 203	Smooth operation	X-295	C
	3H4580A/G42					
		1	Oiler, press-in type, $\frac{1}{4}$	Oiling	X-489	C
		3	Sc., rd. hd., No. 10-32 x $\frac{7}{8}$	To hold bearing retainers	8X-1003	C
		1	Band, head	Can be removed to clean comm. and replace brushes	GBW-24B	C
		1	Screw, rd. hd., No. 10-32 x $1\frac{1}{4}$	Holds head band	8X-715	C
		1	Nut, square, No. 10-32	Used with ref. No. 8X-715	8X-794	C

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>h. Low voltage regulator (figure 22).—</i>						
	1	1	Carbon resistance (Marked 30)	Resistance	TC-516	C
	1	1	Carbon resistance (Marked 60)	Resistance	TC-51M	C
	1	1	C.B. coil assembly	To open and close circuit	CBH-3001S	C
	1	1	Armature spring—13 turns	Tension	VRP-35	C
	1	1	Hex. nut—No. 10-32	Hold coil to frame	SX-173	C
	1	1	Insulating washer	Insulate coil assembly	IBG-55	C
	1	1	Lockwasher—No. 10	Used with Mfr.'s No. IGB-55	12X-196	C
	1	1	Plain washer—No. 10	Used with Mfr.'s No. IGB-55	8X-183-A	C
	1	1	C.B. stationary contact	To open and close circuit	VRP-1034	C
	2	2	C.B. stat. contact sc. No. 8-32 x ¼	Used with ref. No. VRP-1034	X-702	C
	1	1	Cover	Housing	VRS-1002A	C
	1	1	Cover gasket	Used with Mfr.'s No. VRS-1002A	VRP-50	C
	2	2	Cover lockwasher—No. 10	Used with Mfr.'s No. VRS-1002A	12X-196	C
	2	2	Cover screw—No. 10-32 x ¼	Used with Mfr.'s No. VRS-1002A	8X-312	C
	1	1	C.R. coil assembly	Regulate current	VRS-1003S	C
	1	1	Armature spring—11 turns	Used with Mfr.'s No. VRS-10038	CB-123	C
	1	1	Hex. nut—No. 10-32	Used with Mfr.'s No. VRS-10038	8X-173	C
	1	1	Insulating washer	Used with Mfr.'s No. VRS-10038	IGB-55	C
	1	1	Lockwasher—No. 10	Used with Mfr.'s No. VRS-10038	12X-196	C
	3	3	Eyelets	To hold rubber grommets	VRB-36	C
	3	3	Grommets—rubber	To cushion regulator	VRB-37	C
	1	1	Ground terminal	For grounding regulator field	VRP-58	C
	1	1	Ground terminal rivet	Used with Mfr.'s No. VRP-58	X-1268	C
	1	1	Insulating tube	Insulation	TC-115D	C
	1	1	Jumper	Connect voltage regulator to current regulator	VRB-28	C
	1	1	Lead seal	Seals cover to base	X-1316	C

POWER UNIT PE-99-B

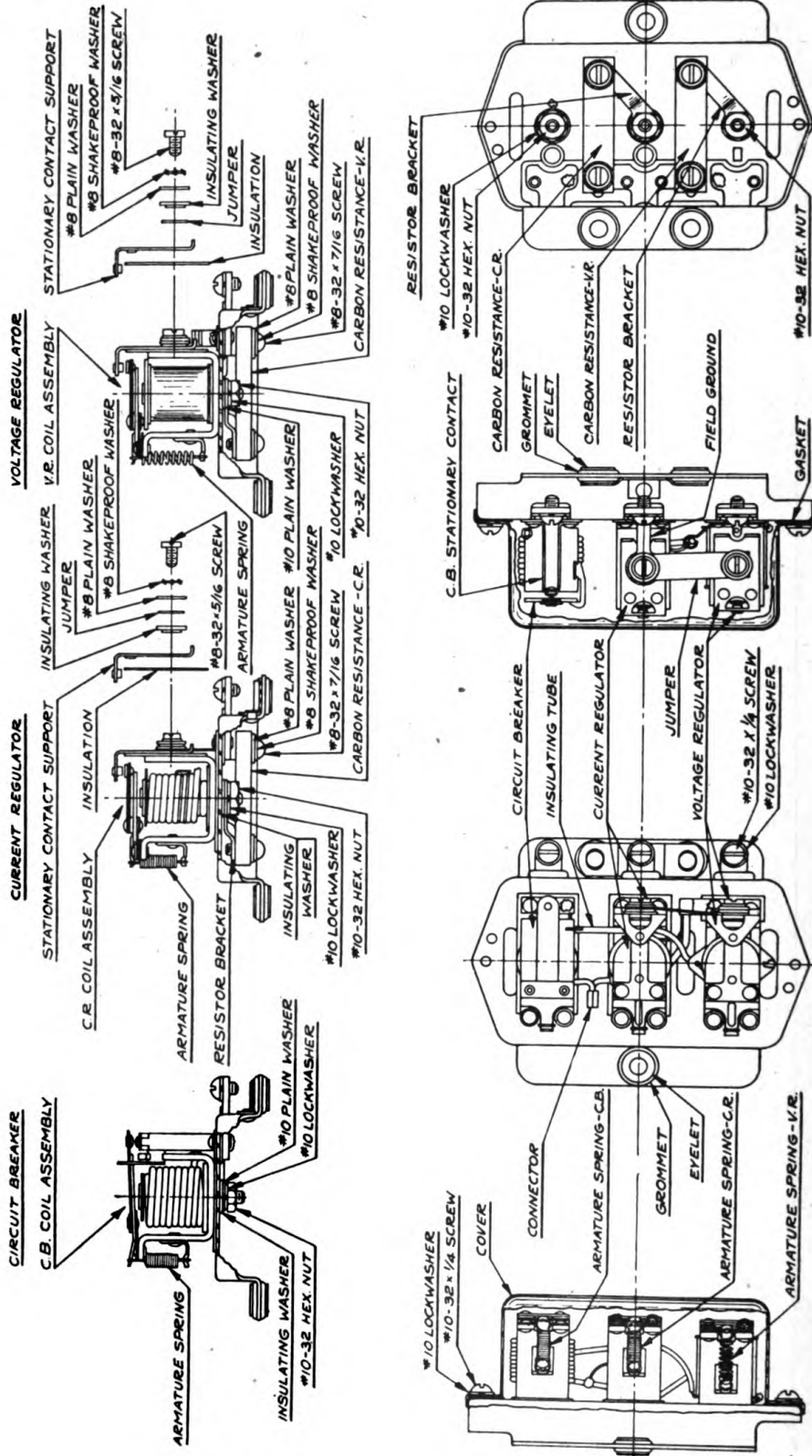


Figure 22.—Low voltage regulator

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
		2	Resistor bracket	Connect current regulator and voltage regulator to carbon re- sistance	VRP-36	C
		1				
		4	Resistor lockwasher No. 8	Used with Mfr.'s No. VRP-36	X-1275	C
		4	Resistor plain washer No. 8	Used with Mfr.'s No. VRP-36	8X-1503	C
		4	Resistor screw—No. 8—32 x 7/16	Used with Mfr.'s No. VRP-36	8X-56	C
		1	Series coil connector	Connect coils from circuit		
		3	Terminal lockwasher No. 10	breaker to current regulator	VRS-4	C
		3	Terminal screws—No. 10—32	Used with Mfr.'s No. 8X-312	X-196	C
		1	V.R. coil assembly	To fasten terminals exterior wires	8X-312	C
				Regulate voltage from charging generator	VRS-3008S	C
		1	Armature spring—14 turns	Keep tension on armature spring	VRP-56	C
		1	Hex. nut—No. 10—32	Used with Mfr.'s No. RS-3008S	8X-173	C
		1	Lockwasher—No. 10	Used with Mfr.'s No. RS-3008S	12X-196	C
		1	Plain washer—No. 10	Used with Mfr.'s No. RS-3008S	8X-183A	C

POWER UNIT PE-99-B

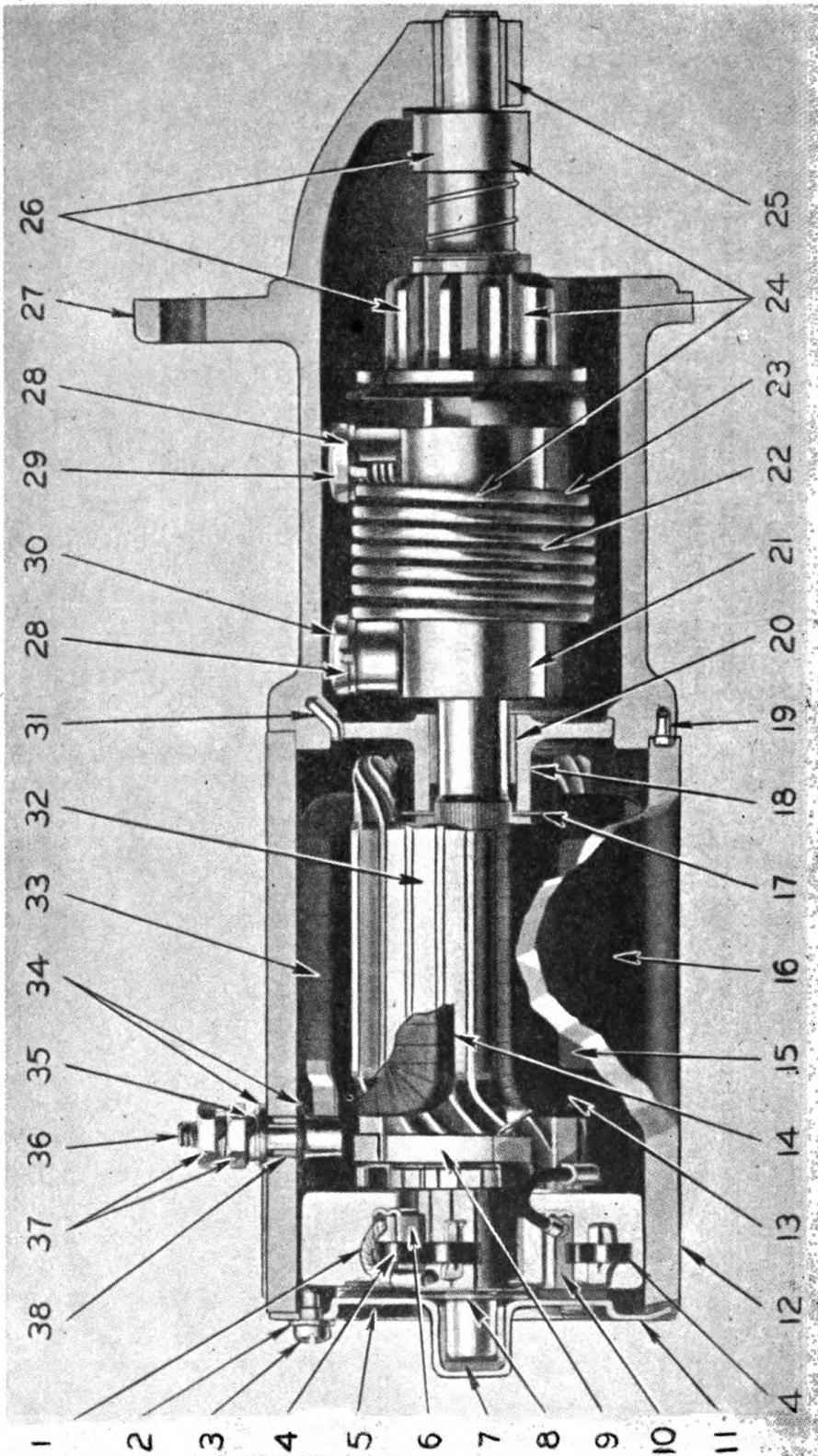


Figure 23.—Starting motor, sectionalized view

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>i. Starting motor (figure 23).—</i>						
1	348448920	2	Brush grounded	To ground commutator to field coils	MAK-1034	C
	3H3114-6/B10					
2		2	No. 10 lockwashers	Used with ref. No. 1	X-196	C
3		2	Frame screw	To fasten brushholder frame	MAK-79	C
4		4	Brush spring	To press brushes tight to commutator	MAK-19	C
5		8	Tubular rivet	To hold brushholder to frame	X-521	C
6		4	Brushholder	Hold brushes	MAK-16A	C
7		1	Felt pad	Seal commutator end of motor	MAK-59	C
8		1	Thrust washer	To prevent oscillation	MAK-55	C
9		1	Connector and brush assembly	To collect current	MBE-1044	C
10	348448925	2	Brush	Used with ref. 9B	MAK-12	C
	3H3114-6/B11					
11		1	Comm. end assy.	To support brushholders	MAK-3002	C
12		1	Head band	Housing	GAS-1024C	C
13		2	Field coil L.R.	To receive current from batteries for starting motor	MBE-1008	C
14		2	Field coil U.R.	Used with ref. 13	MBE-1007	C
15		4	Pole piece	Carry field coils	MAK-29	C
16		4	Pole piece screw	Used with ref. No. 15	MZ-38	C
17		1	Thrust washer	To hold commutator in place on shaft	MU-54	C
18		1	Intermediate brg. assembly	Bearing for drive shaft	MAK-2092	C
19		1	Dowel pin	To keep housing from shifting	GBF-95	C
20		1	Absorbent bronze bearing	For smooth operation	MZ-44-A	C
21						
22						

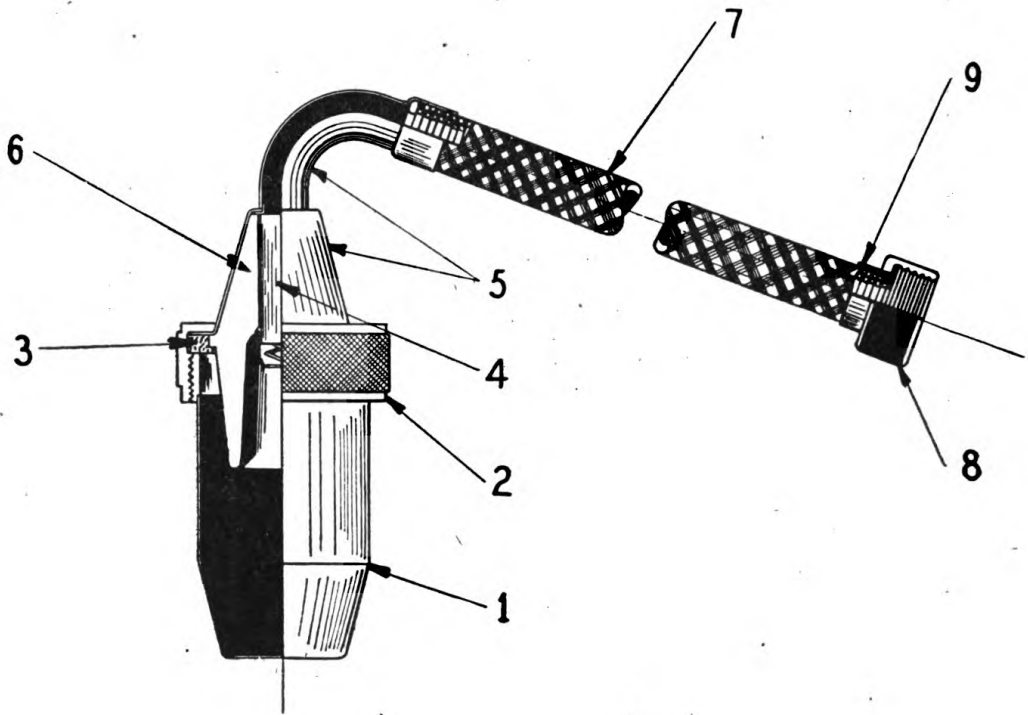


Figure 24.—Ignition shielding

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
23						
24						
25						
26						
27		1	Pinion housing assembly	Mounting and housing	PS-1153	C
28		2	Lockwasher	Used with ref. No. 29	EB-108	C
29		1	Shaft spring screw	To hold shaft spring	EB-7807	C
30		1	Head spring screw	To hold head spring	EB-7806	C
31		1	Dowel pin	Interlocking	MAB-88	C
32		1	Armature assembly	To generate current	MAK-2088	C
33		4	Field coil U.L.	Used with ref. No. 32	MBE-1010	C
34		1	Insulating washer	Insulate terminal post	MAK-49	C
35		1	Plain washer	Used with ref. No. 36	MAK-50	C
36		1	Terminal post	To connect starting motor with start switch	MBC-28	C
37		2	1/4 No. 20 Hex. nut	Used with ref. No. 36	5X-146	C
38		1	Insulating bushing	Insulate terminal post from housing	MAK-51	C
<i>j. Ignition shielding (figure 24).—</i>						
1		1	Main body	Shielding spark plug	A-22061	A
2		1	Body nut	To connect sections together	A-22064	A
3		1	Washer	Seal connection	A-22065	A
4		1	Wire connector	Form contact with spark plug	A-22706	A
5		1	Cap	House connector	A-26643	A
6		1	Insulator	Insulation	A-27487	A
7		1	Flexible tubing	Housing wire	152-21	A
8		1	Ferrule nut	Used with ref. No. 9	U-2164-2A	A
9		1	Ferrule	Connect tubing	U-2164-23A	A

POWER UNIT PE-99-B

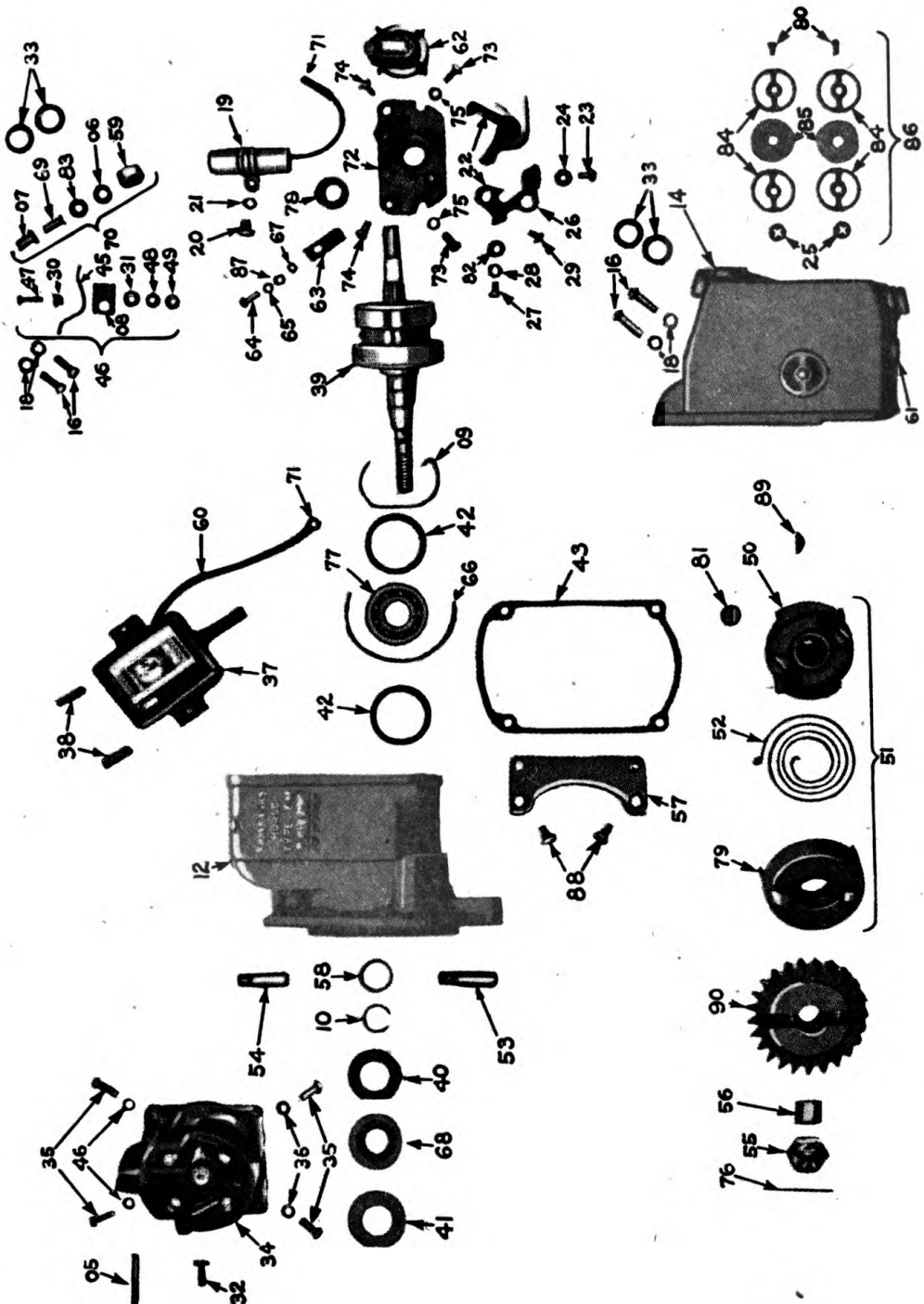


Figure 25.—Magneto parts group

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>k. Magneto (figure 25).—</i>						
05		1	Distributor high tension lead rod	Carries high tension current	D983A	A-1
06		1	Ground cable ferrule	Connection	A1077	A-1
07		1	Ground cable terminal insulator	Insulation	A1166	A-1
08		1	Ground switch strip guide	Guide	B1355	A-1
09		1	Rotor bearing snap ring	Lock bearing	B1496B	A-1
10		1	Rotor shaft snap ring	Lock rotor	B1498D	A-1
12		1	Frame—complete GX2425 always includes: Frame field lamination Assembly—(not furn. sep.)	Housing Provides spark for ignition	GX2425	A-1
14		2 1	End cap—radio—shielded—complete Cable outlet bushing (not furn. sep.) C2430A always includes: Cable outlet bushing (not furn. sep.)	Connecting radio shield cable	C2430A	A-1
		1	Ground cable outlet bushing (see B2744A)	Used with ref. 14		
		2 4 2 2	Ventilat. screens (see A6032A) Vent. screen wash. (see A6030) Vent. screen rivets (see A5961) Vent. screen locking wash. (see A2448)	Used with ref. 14 Used with ref. 14 Used with ref. 14 Used with ref. 14		
15		2	End cap screws (No. 10-24 x 1/2")	Holds bearing and breaker support plate	10S8A	A-1
16		2	End cap screws (No. 10-24 x 5/8")	Holds magneto	10S10A	A-1
18		4	End cap screws, lockwashers (No. 10)	Locks nuts	10LW2	A-1

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
19		1	Condenser—complete M2433 always includes:	Suppression	M2433	A-1
		1	Condenser lead wire and tube (not furn. sep.)	Used with ref. 19		
		1	Cond. lead wire term. (see A4361)	Used with ref. 19		
20		1	Cond. mtg. screw (No. 8-32 x 5/16")	Mounting	8S5N	A-1
21		1	Cond. mtg. screw lockwasher (No. 8)	Mounting	8LW3	A-1
22	373700500 3H2699-21/P10	1	Break. arm. stationary bracket, and contact points T2437 always includes:	Mounts fixed contacts and breaker	T2437	A-1
		1	Breaker arm (not furn. sep.)	Used with ref. 22		
		1	Breaker arm spring (not furn. sep.)	Used with ref. 22		
		1	Breaker arm contact point—Tungsten (not furn. sep.)	Used with ref. 22		
		1	Breaker arm lead (not furn. sep.)	Used with ref. 22		
		1	Breaker arm cont. point washer (not furn. sep.)	Used with ref. 22		
		1	Stat. supp. bracket and contact point (see G2454)	Used with ref. 22		
		1	Cam felt wick (see No. 2788)	Used with ref. 22		
23		1	Break. arm term. screw (No. 8-32 x 5/16")	Hold breaker arm	8S5N	A-1
24		1	Break. arm term. screw lockwasher (No. 8)	Lock breaker arm screw	8LW3	A-1

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
25		2	Ventilating screen locking washer	Lock ventilating screen supports break. arm	A2448	A-1
26		1	Stationary supp. bracket and cont. point	Supports breaker arm	G2454	A-1
			G2454 always includes:			
		1	Stat. cont. supp. brack. (not furn. sep.)	Used with ref. 26		
		1	Prim. insulating bushing (not furn. sep.)	Used with ref. 26		
		1	Prim. insulat. wash. (not furn. sep.)	Used with ref. 26		
		1	Prim. cont. screw bush. (not furn. sep.)	Used with ref. 26		
		1	Prim. cont. screw insulator (not furn. sep.)	Used with ref. 26		
		1	Prim. cont. point Tungsten (not furn. sep.)	Used with ref. 26		
		1	Prim. cont. screw wash. (not furn. sep.)	Used with ref. 26		
27		1	Stationary brack. screw (No. 8—32 x 5/16")	Used with ref. 26	8S5N	A-1
28		1	Stationary brack. screw lock-washer (No. 8)	Used with ref. 26	8LW3	A-1
29		1	Stat. brack. adj. screw	Used with ref. 26	C2455	A-1
30		1	Prim. ground insulat. bush.	Provides insulation for ground wire	G2457A	A-1
31		1	Prim. ground flat washer	Hold bush. in place	D2458	A-1

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
32	•	1	Coil lead brush E2460B always includes:	Generates current	E2460B	A-1
		1	Coil lead brush spring (not furn. sep.)	To hold brush on commutator		
33		4	High tension cable sock, rubber seal	Provides insulation for high tension wire	B2473	A-1
34		1	Distributor block cable outlet C2474E always includes:	Distribution of current	C2474E	A-1
		2	Cable outlet insert (not furn. sep.)	Used with ref. 34		
		2	Cable outlet insert (not furn. sep.)	Used with ref. 34		
		1	High tension lead insert (not furn. sep.)	Used with ref. 34		
		1	High ten. brush hold. ins't (not furn. sep.)	Used with ref. 34		
		1	High ten. lead conn. ins't (not furn. sep.)	Used with ref. 34		
35		4	Distributor block cable outlet screw (No. 8—32 x 9/16")	Secures cable outlet plate in place	8S9N	A-1
36		4	Distributor outlet screw lock-washer (No. 8)	Used with ref. 35	8LW3	A-1
37		1	Coil—complete	Induces high voltage to spark plug	H2477	A-1
			H2477 always includes:			
		1	Coil winding (not furn. sep.)	Used with ref. 37		
		1	Coil second. lead (not furn. sep.)	Used with ref. 37		

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
		1	Coil second. lead shield (not furn. sep.)	Used with ref. 37		
		5	Coil tape—wide (not furn. sep.)	Used with ref. 37		
		3	Coil tape — narrow (not furn. sep.)	Used with ref. 37		
		1	Coil sticking tape (not furn. sep.)	Used with ref. 37		
37		1	Coil bridge lamination assembly (not furn. sep.)	Used with ref. 37		
		1	Coil prim. lead wire (not furn. sep.)	Used with ref. 37		
		1	Coil prim. lead wire tube (see E2736)	Used with ref. 37		
		1	Coil prim. lead wire term (see A4361)	Used with ref. 37		
38		2	Coil bridge set screw ($\frac{1}{4}$ —20 x $\frac{3}{4}$)	Holds coil	25SS12A	A-1
39		1	Magnetic Rotor—complete VX2480 always includes:	Creates air blast to cool engine	VX2480	A-1
		1	Rotor shaft (not furn. sep.)	Used with ref. 39		
		1	Rotor magnet (not furn. sep.)	Used with ref. 39		
		2	Rotor lam. assembly (not furn. sep.)	Used with ref. 39		
		1	Rotor die casting (not furn. sep.)	Used with ref. 39		
40		1	Inner retaining washer	Used with ref. 39	C2492	A-1
41		1	Outer retaining washer	Used with ref. 39	A2492A	A-1
42		2	Bearing insulating wash.	Used with ref. 39	C2493	A-1

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
43		1	End cap gasket	Used with ref. 39	H2498	A-1
45		1	Ground switch strip	Used with ref. 39	J2514	A-1
46		1	Prim. ground switch group—radio-shielded A2514J always includes:	Ground radio shield	A2514J	A-1
		1	Ground switch strip (see J2514)	Used with ref. 46		
		1	Ground screw bush. (see G24574A)	Used with ref. 46		
		1	Ground switch strip guide (see B1355)	Used with ref. 46		
		1	Ground screw washer (see D2458)	Used with ref. 46		
46		1	Ground screw (see 6S8N)	Used with ref. 46		
		1	Ground screw lockwasher (see 6LW1)	Used with ref. 46		
		1	Ground screw nut (see 6N1)	Used with ref. 46		
47		1	Prim. ground screw (No. 6—32 x 1/2")	Hold prim. ground wire	6S8N	A-1
48		1	Prim. ground screw lockwasher (6LW1)	Used with ref. 47	6LW1	A-1
49		1	Prim. ground screw nut (6N1)	Used with ref. 47	6N1	A-1
50		1	Impulse coupling hub assembly—type UB9 EX2563 always includes:	Carry impulse couplings	EX2563	A-1
		1	Hub plate (not furn. sep.)	Used with ref. 50		
		1	Hub shaft member (not furn. sep.)	Used with ref. 50		
		2	Hub pawls (not furn. sep.)	Used with ref. 50		
		2	Hub pawl rivets (not furn. sep.)	Used with ref. 50		

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
51		2	Hub pawl washers (not furn. sep.)	Used with ref. 50		
		2	Hub pawl springs (see C5693)	Used with ref. 50		
		1	Impulse coupling — comp. — type UB9	Makes and breaks contact	GX2563C	A-1
			GX2563C includes:			
		1	Coupling hub assembly (see EX2563)	Used with ref. 51		
		1	Coupling drive spring (see E2565)	Used with ref. 51		
51		1	Coupling shell (see Y5957)	Used with ref. 51	E2565	A-1
52		1	Coupling drive spring	Used with ref. 51	C2568	A-1
53		1	Coupling pawl stop pin (1 5/16" long)	Used with ref. 51		
54		1	Coupling pawl stop pin (1 1/8" long)	Used with ref. 51	02568	A-1
55		1	Coupling nut	Used with ref. 51	M2570	A-1
56		1	Coupling gear bushing	Used with ref. 51	A2572	A-1
57		1	End cap extension plate	Housing	A2636	A-1
58		1	Thrust bearing shim	Adjust bearing	C2723	A-1
59		1	Ground cable outlet nut	Hold ground cable	B2735A	A-1
60		1	Primary lead wire tube	Protection	E2736	A-1
61		1	Ground cable outlet bushing	To fasten ground cable	B2744A	A-1
62		1	Distributor rotor	Distribute current	M2765	A-1
			M2765 always includes:			
		1	Distributor rotor insert (not furn. sep.)	Used with ref. 62		
63		1	Cam felt wick	Lubrication	E2788	A-1
64		1	Cam wick screw (No. 6—32 x 3/8")	Hold wick	6S6A	A-1

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
65		1	Cam felt wick screw lockwasher (No. 6)	Used with ref. 65	6LW2	A-1
66		1	Rotor bearing insulating strips	Insulating	B2824	A-1
67		1	Cam felt wick spacer	Spacing	A2982	A-1
68		1	Bearing seal rubber wash.	Seal	G3861	A-1
69		1	Ground cable terminal	To hold terminal	A3969	A-1
70		1	Ground cable terminal group A3969C includes: Ground cable ferrule (see A1077)	Connect ground cable	A-3969C	A-1
		1	Ground cable ferrule (see A1077)	Used with ref. 70		
70		1	Ground cable term. insulat. (see A1166)	Used with ref. 70		
		1	Ground cable nut (see B2735A)	Used with ref. 70		
		11	Ground cable terminal (see A3969)	Used with ref. 70		
		1	Terminal insulating washer (see B6018)	Used with ref. 70		
		1	Outlet bushing (see B2744A)	Used with ref. 70		
71		2	Lead wire terminal (for No. 8 screw)	Fasten lead wire	A4631	A-1
72		1	Bearing and breaker support plate L4631 always includes: Bearing plate (not furn. sep.) Bearing plate ful. pin (not furn. sep.)	Support breaker bearing	L4631	A-1
		1	Rotor sleeve bearing (see B5950A)	Used with ref. 72		
		1	Cam felt wick (see E2788)	Used with ref. 72		

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
		1	Cam felt wick spacer (see A2982)	Used with ref. 72		
		1	Cam felt wick screw (see 6S6A)	Used with ref. 72		
		1	Cam felt wick screw lockwasher (see 6LW2)	Used with ref. 72		
		1	Cam felt wick washer (see C6503)	Used with ref. 72		
73		2	Bearing and breaker support plate screw (No. 8-32 x $\frac{3}{8}$ ")	Hold bearing and breaker	8S6A	A-1
74		2	Bearing and breaker support plate screw (No. 8-32 x $\frac{3}{8}$ ")	Hold breaker support plate	8S6G	A-1
75		2	Supp. plate screw lockwasher (No. 8)	Used with ref. 74	8LW3	A-1
76		1	Impulse coupling nut lockwire	Hold impulse coupling	A5913A	A-1
77		1	Rotor ball bearing	To carry the rotor	C5942	A-1
78		1	Rotor sleeve bearing	Used with ref. 77	B5950A	A-1
79		1	Impulse coupling shield	Shielding	Y5957	A-1
80		2	Ventilating screen rivet	Hold ventilating screen	A5961	A-1
81		2	Impulse coupling pawl spring	Tension	C5963	A-1
82		1	Stationary contact support	Used with ref. 80	B5969	A-1
83		1	Primary ground insulating washer	Insulation	B6018	A-1
84		4	Ventilating screen washer	Used with ref. 80	A6030	A-1
85		2	Ventilating screen	To keep foreign matter	A6032A	A-1
86		2	Ventilating screen group A6032AC group includes:	To make up ventilator	A6032AC	A-1
		2	Ventilating screens (see A6032A)	Used with ref. 86		

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
		4	Ventilating screen washer (see A6030)	Used with ref. 86		
		2	Ventilating screen rivet (see A5961)	Used with ref. 86		
		2	Ventilating screen locking washer (see A2448)	Used with ref. 86		
87		1	Cam felt wick holding washer	Seal rotor bearings	C6503	A-1
		1	Complete gasket kit	Used with ref. 87	GK16	A-1
		1	Complete gasket kit	Used with ref. 87	GK17	A-1
			GK16 and GK17 always include:			
87		1	Outer retaining washer (see A2492A)	Used with ref. 87		
		1	End cap to frame gasket (see HS498)	Used with ref. 87		
		1	Rotor bearing sealing wash. (see G3861)	Used with ref. 87		
88		2	End cap extension plate screw (No. 10-24 $\frac{3}{8}$ ")	Holds extension plate	10S6G	A-1
89		1	Coupling hub key	To fasten coupling to drive shaft	3K1	A-1
90			Drive gear (Order from Wisconsin Motor Corporation)			

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>l. Automatic hand-crank control relay.—</i>						
		1	Relay	Grounds magneto to stop engine and releases ground to start engine	33782	O
		1	3-pole selector switch	For testing 3 phases with one ammeter	E50	W
		1	Asbestos laminated phenolic compound terminal block	To hold binding posts	T-5	O
		4	$\frac{3}{4}$ No. 10—24 round head machine screws brass	Binding posts	H-21	Z
		20	10—24 hex nuts brass	For binding posts	J-9	Z
		18	$\frac{3}{16}$ lockwashers, cadmium plated	For binding posts	K-7	Z
		6	$\frac{1}{2}$ No. 10—24 round head machine screws, cadmium plated	Holding cabinet	H-14	Z
		2	$1\frac{1}{2}$ No. 10—24 round head machine screws, cadmium plated	Terminal block	H-20	Z
		1	Steel cabinet	To hold relay	D	M

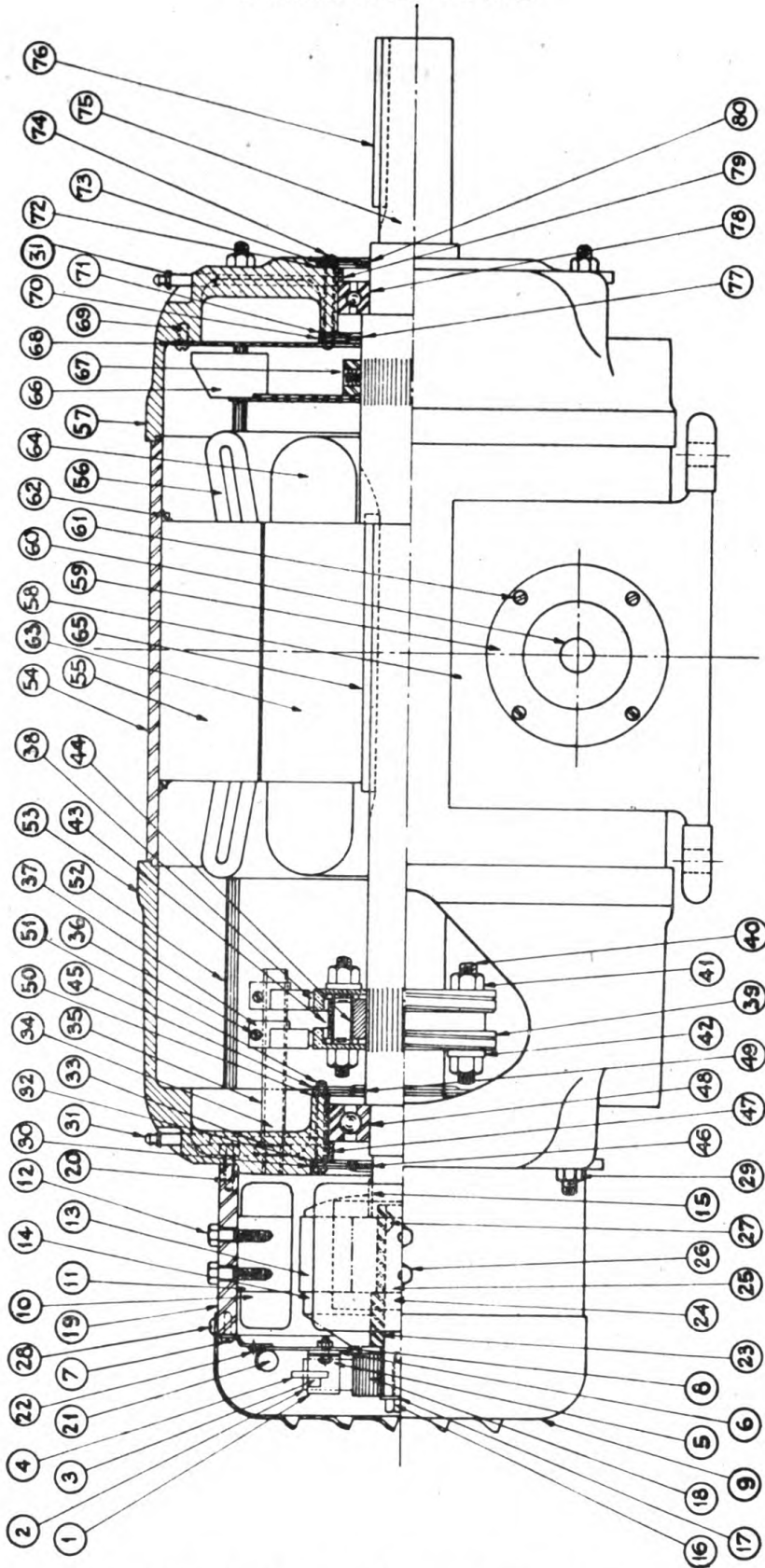


Figure 26.—A-C power generator

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>m. A-C power generator (figure 26).—</i>						
1	347074610	1	Brushholders—Complete	Holds brushes	P-2200	S
2	3H2420-1/B10	2	Brushes	Generates current	S-939	S
3	347074610	2	Brush spring holder	Holds brush springs	S-952	S
4	3H2420-1/B11	2	Brush spring	Holds brushes on commutator	S-944	S
5		2	Brushholder screw	Fastens brushholder to stud	S-989	S
6		2	Brushholder insulation	Insulate	S-951	S
7		3	Brushholder mtg. screw	For mounting brushholder	S-989-2	S
8		1	Brushholder backing	Support	S-949	S
9		1	Exciter end cover	Protection	S-293	S
10		1	Interpole windings	To generator current D.C.	24	S
11		1	Exciter interpole	To hold interpole windings	S-600-2	S
12		2	Interpole screws	To hold poles	S-985	S
13		1	Armature—Complete	Generator current	P-2159	S
14			Arm. windings data			S
15		1	Insulator fiber tbq.	Insulate		S
16		1	Arm. lock screw	To hold armature in place	S-375	S
17		1	Arm. lock washer	To keep screw tight	S-981	S
18		1	Commutator	Generator current	S-305	S
19		1	Exciter band	Housing	S-367	S
20		6	Exciter mtg. screw	To hold exciter housing	S-989	S
21		1	Condenser	Suppression	S-968	S
22		1	Condenser mtg. screw	Mounting	S-991	S
23		1	Exciter quill			S
24		1	Main field coils	Generate current		S
25		2	Main field pole	To hold main field	S-563	S

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
26		4	Main field pole screw	To hold main field pole	S-985-2	S
27		1	No. 5 Woodruff key	To lock exciter amature to shaft	S-986	S
28		3	End cover screw	Hold cover	S-989	S
29		8	Head nut	For generator housing bolt	S-980-2	S
30		1	External Seal O.P.E.	Retain grease	S-393-1	S
31		2	Grease fittings	For greasing bearings	S-987-1	S
32		1	Ext. grease gasket	Grease retainers	S-961	S
33		3	Brushholder lock nut	Keep nut tight	S-980-3	S
34		1	Brushholder stud	To hold brushholders	S-307-1	S
35		1	Brushholder fiber tbg.	Insulating	S-307-1	S
36		2	Brushholder screw	Hold brushholder	S-985	S
37	347074600	2	Brushholder—complete	Hold brushes	S-279	S
	3H2420-1/B10					
38		4	Brushes	Generator current	S-940	S
39		1	Collector ring assm.	To collect current	S-308	S
40		3	Collector ring studs	To hold collector ring assm.	S-923	S
41		8	Hex. nuts	For connector ring studs	S-980	S
42		10	Bklt. insl. washer	Insulation	S-389	S
43		1	Collector ring hub	To hold collector rings	S-378	S
44		3	Insl. fiber tubing	Insulation	S-308	S
45		1	Int. seal O.P.E.	To retain grease	S-393	S
46		1	Ext. seal felt	To retain grease	S-997-3	S
47		1	Bearing spacer	To space bearings	S-120-8	S
48	347074620	1	Bearing O.P.E.	To carry the load on shaft	6308	S
	3H2420-1/B20					
49		1	Int. seal felt	Grease retainer	S-997-4	S
50		1	Int. grease gasket	Grease retainer	S-961	S
51		6	Seal screws	To hold grease retaining washers	S-988	S

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
52		4	Through bolts	To hold housing	S-134	S
53		1	End bell O.P.E.	Housing	K-3032	S
54		1	Stator bank	Housing	S-119-7	S
55		1	Stator assm.	Generator current	K-3005	S
56			Stator coils	Generator current		S
57		1	End bell P.E.	Housing	K-3002	S
58		1	Base assembly	Support		S
59		2	Conduit closure	Housing wires	S-157	S
60		2	Conduit knockout	For wires to pass through	S-157	S
61		8	Closure screws	To fasten closure	S-989-2	S
62		8	Lamination blocks	Generator current		S
63		1	Rotor assm.	Generator current	P-2203	S
64		1	Rotor windings data	Generator current	D-800	S
65		1	Rotor key	Lock rotor to drive shaft		S
66		1	Fan assembly	Cool generator	P-2022	S
67		4	Allen set screw	Hold fan hub to the drive shaft	S-1025-4	S
68		1	Baffle	To spread air	S-211	S
69		14	Self tap screw	To hold baffle	S-991	S
70		1	Internal seal P.E.	Retain grease	S-393-4	S
71		1	Int. grease gasket	Retain grease	S-961	S
72		1	Ext. grease gasket	Retain grease	S-961	S
73		1	Ext. seal P.E.	Seal grease retainers	S-393-3	S
74		6	Seal screws P.E.	Hold seal	S-988-1	S
75		1	Shaft	Drive commutators	P-2199	S
76		1	Shaft key	To lock drive pulley	S-263-4	S
77		1	Int. seal felt	Retain grease	S-9976	S
78		1	Bearing P.E.	To carry the load on shaft	6210	S
79		1	Bearing spacer	Hold bearing in place	S-120-8	S
80		1	Ext. seal felt	Retain grease	S-997-5	S

POWER UNIT PE-99-B

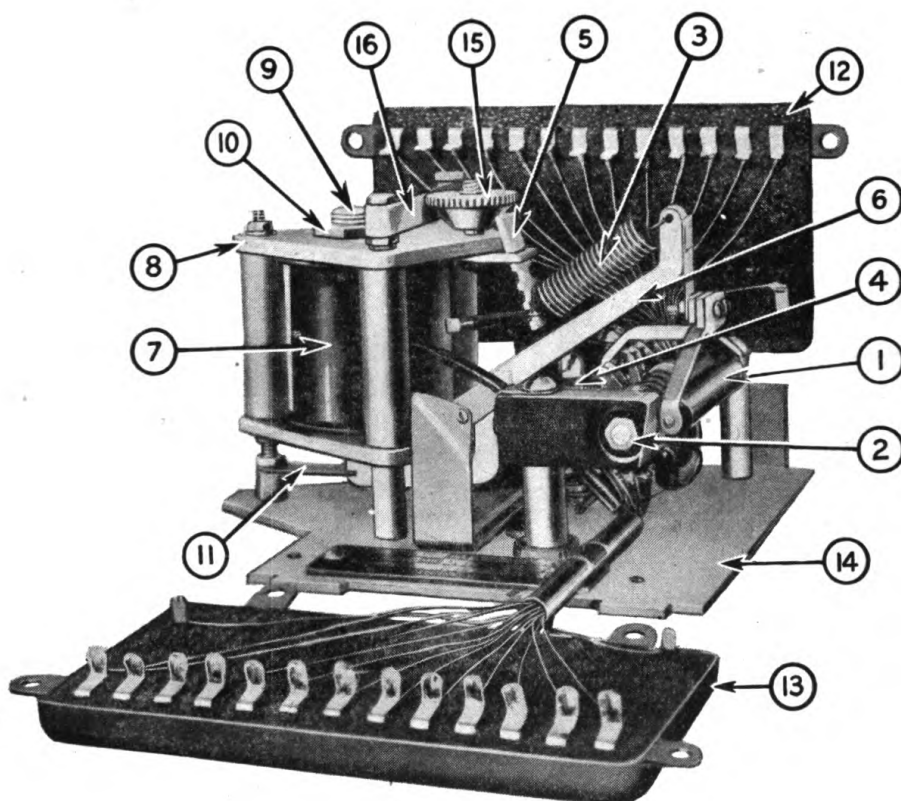


Figure 27.—A-C generator voltage regulator

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>n. Voltage regulator for a-c generator (figure 27).—</i>						
1		1	Contact roller assembly	Changes resistance	16631.21-1	B
2		1	Silver commutator	Contact making element	16631.3-1	B
3		1	Solenoid spring	Solenoid current control	69-444	B
4		1	Contact pressure spring	Contact pressure control	2.54-10	B
5		1	Adjustable spring holder	Adjust spring	16631.19-1	B
6		1	Regulator crossarm plunger assembly	Support roller	16697.12-1	B
7		1	Solenoid coil	To maintain generator voltage	16606.30-1	B
8		1	Solenoid magnetic structure	Magnetic structure and support	16606.6-7	B
9		1	Adjustable magnetic core	Magnetic circuit adjustment	16606.6-4	B
10		1	Locknut	Lock magnetic core	16606.6-3	B
11		1	Solenoid stop	Limit plunger travel	16631.23-1	B
12		13	Left resistor plaque	Adjustable resistance	16606.21-1	B
13		13	Right resistor plaque	Adjustable resistance	16606.21-2	B
14		1	Regulator base	Support	16631.13-1	B
15		1	Solenoid spring adjusting nut	Spring adjustment	16631.19-6	B
16		1	Lock spring	Hold spring adjustment nut	16631.8-1	B
17 (not shown)			Cover	Enclosure	16631.8-1	B

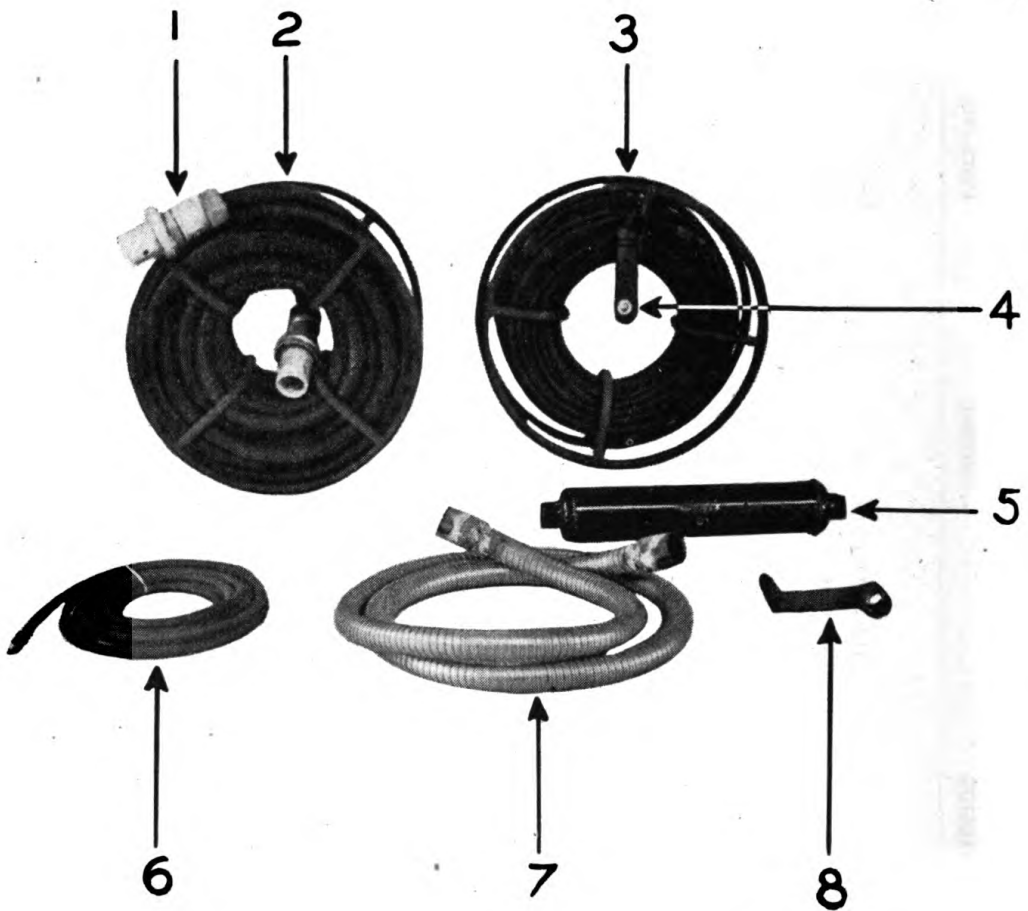
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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>o. Control cabinet.—</i>						
		1	Control cabinet complete with door		10	M
		1	Cabinet hood removable	To get at back of instruments	A-7	M
		4	¼ No. 20 wing nuts	To hold cabinet doors	J-14	Z
		4	Door keepers	To keep doors from shifting	A-15	M
		2	Support angle iron for "A" cabinet	To hold hood in place	A-27	M
		1				
		1	Tool compartment cover		A-18	M
		1	Grouse Hinds receptacle	For power cable	AR-637	O
		2	6-volt batteries	For starting power unit	2H	N
		2	Battery tray and hold down	To hold batteries in place	A-23	M
		4	Hold down bolts 5/16 x 8" No. 20 thread			
		4	5/16 No. 20 wing nuts	To hold batteries in place	H-5	Z
		4	5/16 cut washers	To hold batteries in place	J-15	Z
		4	5/16 lock washers	To hold batteries in place	K-1	Z
		1	4 gauge ground strap	To hold batteries in place	K-4	Z
		1	4 gauge connector with terminals	To ground batteries	45-13-58	P
		1	4 gauge with terminals	To connect the two batteries	24-4	P
		1		To connect batteries with start	21-50-41	P
		2	Belt guards	contactor Guard	A-28	M

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Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>p. Control panel (figure 3).—</i>						
16	326218220 3F2745.1	1 1	Control panel Frequency meter	Hold instruments Records frequency	A-4 31-F	M D
1	3F1030-16	1	Ammeter battery 0—30 plus minus	Records charge and discharge	95245	X
3	326488000 3F3320-1	1 1	Elapsed time meter	Records running time	RT2H	D
5		1	Volt meter—150 volts a.c.	Records voltage	32-A	V
7	325832480 3F1050-24	3	Ammeters 0-50 amps.	Records amperes	32-C	V
6		1	Selector switch	Selecting phase to record voltage	4875	W
4	337354100 3H906-50-5	1 1	3-pole 60 amp. circuit breaker	Protection of generator	J686	Q
9		1	120 volt a.c. receptacle	Service	9200	O
12	627809-5	1	Terminal block	Hold terminals		O
14	371445000 3H4962-1	1	Generator voltage regulator	Regulate voltage	ED3192L	B
10	627813	1	Receptacle for remote control	To connect cable to control panel	7557	O
8-10		2	Push button type switches	To stop and start engine	115	O
13		1	3-way toggle switch	To switch voltage regulator on or off	3A-125	O

POWER UNIT PE-99-B



1. Power Cable Plug
2. Power Cable
3. Remote Control Cable
4. Remote Control Switch
5. Muffler
6. Gas Line
7. Flexible Exhaust Line
8. Engine Crank Handle

Figure 28.—Cable reels and accessories

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>q. Accessory equipment (figure 28).—</i>						
		1	Tool box	To hold tools and spare parts	26	M
		1	Oil can	For oiling engine	37	Z
		2	6-volt batteries	For starting engine		
		1	Skid base assembly	To support equipment	650	M
		1	Control panel hood	To house panel	10	M
		1	Switch for hand cranking	When batteries are exhausted	12	O
		3.	Terminals for power cables	To attach wires	H-10	Z
		1	3 pole, 60 amp. receptacles	For connecting power cable	AR-637	O
		1	Drive pulley	To drive pulley on generator	5-4PD5B	L
		1	Driven pulley	To drive generator	6-6PD5B	L
		1	Tool and spare part cabinet	To support control cabinet	21	M
		1	16" battery cable	Connect to start contactor	E-3	P
		1	16" ground cable	To ground battery to engine	E-4	P
		1	24" connection cable	To connect the two batteries	E-5	P
		1	150 ft. power cable	To carry power where required	19	O
		1	150 ft. remote control cable	To start or stop engine at a distance	20	O
		1	Plug	Connecting power cable	APJ6975	O
		1	Remote control cable plug	Connecting cable	7567	O

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>r. Tools.—</i>						
273	373460680 3H1925-4/C25	1	20 ft. auxiliary gas line	Starting engine	23	R
		1	Lifting eye for lifting generator			S
		1	Engine hand crank		U-212A	A
		1	Pressure grease gun		27	
		2	Tappet wrenches		28	
		1	Small screw driver		29	
		1	Large screw driver		30	
		1	Feeler gauges		31	
		1	Spark plug wrench		32	
		1	Adjustable wrench		33	
		5	Open-end wrenches		34	
		1	Monkey wrench		35	
		1	Gas pliers		36	
		1	Oil can		37	
		1	Machinist's hammer			
		2	Sheets No. 00 sandpaper			
		1	2 oz. can of valve grinding compound			
		1	Valve lifter			

SECTION V

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
<i>Spare parts kit.</i> —						
*†	.	1 set	Starting motor brushes for YA-7 starter consisting of:			
*†			Brushes		MAK-12	A
10*†	348448925	2				
	3H3114-6/B11				MAK-1034	A
1*†	348448920	2	Brushes—grounded			
	3H3114-6/B10				GBW-2012-AS	A
*†	346828991	1 set	Generator brushes for YB-19-A generator consisting of:			
	3H2411-11/B10	2	Brushes			
*†						
*†						
104*†	373462800	4	Exhaust valves		AE-75-B	A
	3H1925-4/V2					
105*†	373462590	4	Valve springs		AF-46	A
	3H1925-4/S40					
107*†	344954000	4	Valve spring seats		AG-26	A
	3H1909-D/S108				AH-9	A
108*†	373461580	4 pr.	Valve spring seat bushings			
	3H1925-4/L20					
*†		2	Oil filter cartridges		RV-27-S	A
*†		2	Gasket sets		Q-10-A	A
221*†	373460850	2	Cylinder head gaskets		QD-613-B	A
	3H1925-4/S33					
169A*†	373460400	1	Generator drive belt		MH-133	A
	3H1925-4/B10					
*†		1	Connecting rod assembled with:		DA-51-A	A
124*†	373461880	1	Piston		DB-199	A
	3H1925-4/P21					

POWER UNIT PE-99-B

Ref. No.	S.C. Stock No.	Quan.	Name and Description	Function	Mfr.'s Part No.	Mfg.
125*†	373462100	2	Piston rings		DC-163	
126*†	3H1925-4/R30	1	Piston rings		DC-163-1	
127*†	373462-110	1	Piston rings		DC-109	
128*†	3H1925-4/R31	1	Piston pin		DE-65	
*†	373461890	2	Bolts		PB-148	
*†	3H1925-4/P22	2	Bolt nuts		PD-148	
199*†		2	Retainers		PK-52	
*†		2	Shims		QA-108-A	
*†		2	Cotter pins		XI-1	
125*†	373462100	8	Piston rings		DC-163	
126*†	3H1925-4/R30	4	Piston rings		DC-163-1	
27*†	373462110	4	Piston rings		DC-109	
140*†	3H1925-4/R32	1	Cork seal		HF-261	
*†	373462380	1	Breaker point set		T-2437	
142*†	3H1925-4/55	8	Valve seat inserts		HG-201-B	
*†		12	Spark plugs		26	

* Furnished as Running Spares.

† Furnished for Depot Stock.

SECTION V

48. STANDARD NUTS, BOLTS, WASHERS, ETC.—

Quan.	Size	Length	Thread	Description	Function
6	5/16		24	Hex. nuts	2 for mounting oil filter
4	5/16		24	Brass nuts	4 For lower to upper manifold
1	3/8		24	Hex. nut	For lower to upper manifold
12	7/16		20	Hex. nuts	For magneto mounting stud
1	3/8		16	Hex nut	For mounting cylinder block to crankcase
19	1/4		20	Hex nut	For lower magneto mounting screw
9	1/4		20	Nut	For governor spring adjusting screw pin
					5 for mounting tank to rear panel
					4 for mounting air filter
4	3/8		16	Nuts	For mounting side rails to engine supports
4	3/8		24	Brass nuts	For manifold to cylinder mounting studs
8	5/16		24	Hex. nuts	For valve tappet adjusting screws
1	#5		40	Hex. nuts	For governor control rod—carburetor end
80	1/4			Lockwashers	2 for mounting fuel pump adaptor
					6 for mounting splash plates to case
					6 for mounting air shroud screen
					33 for mounting air shroud
					10 for canopy
					5 for rear panel
					6 for partition plate
					8 for mounting fuel tank
					4 for mounting air filter
60	5/16			Lockwashers	14 for mounting crankcase bottom plate
					6 for mounting shroud to gear cover
					20 for mounting gear cover spacer and governor housing to case
					2 for mounting fuel pump
					2 for mounting carburetor

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Quan.	Size	Length	Thread	Description	Function
12	3/8			Lockwashers	2 for mounting oil filter 8 for lower to upper manifold 2 for mtge. starter support bracket 4 for mounting side rail to engine supports 4 for mounting manifold to cylinder 6 for mounting main bearing plate take-off end 1 for mounting magneto—upper stud 1 for mounting magneto—lower screw For mounting cylinder blocks For mounting engine support For mounting oil pump cover For mounting camshaft gear For mounting bearing retainer plate 1 for oil hole to pump 1 for oil header 3 for oil spray nozzle holes 1 for governor housing 1 for oil pump lockscrew hole For gear cover For valve tappet plates For lower magneto mounting screw 34 for mounting cylinder heads 1 for mounting air filter For oil pump cover 6 for flywheel screen 23 for mounting cylinder cover and side covers 10 for canopy 6 for partition plate 5 for rear panel to engine support
12	7/16			Lockwashers	
4	7/16			Lockwashers	
6	7/16			Lockwashers	
3	5/16			Lockwashers	
4	5/16			Lockwashers	
7	1/8			Slotted pipe plugs	
1	1/4			Slotted pipe plug	
1	5/16			Copper washers	
1	3/8			Plain washer	
35	3/8			Plain washers	
6	10		32	Round head screws	
29	10		32	Round head screws	
21	1/4	3/8"	20	Round head screws	

SECTION V

Quan.	Size	Length	Thread	Description	Function
8	1/4	1 1/2"	20	Round head screw	For mounting tank to rear panel
1	1/4	1"	20	Round head screw	Support rear panel
5	1/4		20	Screws	For mounting front panel to shroud
1	1/4	3-1/4"	20	Round head screw	For mounting panel to cylinder L.H. side
6	1/4		20	Fillister head screws	For mounting splash plates
2	1/4		20	Fillister head screws	For mounting fuel pump adaptor
4	1/4		20	Flat head screws	For mounting bearing retainer plate fan end
9	1/4		20	Hex. head screws	4 for mounting lower cylinder shroud 1 for exhaust manifold R.H. side
4	1/4	3/8"	20	Hex. head screws	For mounting air filter
2	1/4		20	Hex. head screw	For mounting cylinder head deflectors
6	1/4	3/4"	20	Hex. head screws	For mounting shroud to gear cover
16	5/16		18	Hex. head screws	14 for mounting crankcase bottom cover 2 for mounting fuel pump
7	5/16		18	Hex. head screws	5 for mounting spacer to crankcase 2 for mounting spacer to gear
6	5/16	7/8"	18	Hex. head screws	2 for mounting carburetor 4 for mounting governor housing
3	5/16	1"	18	Hex. head screws	For mounting camshaft gear
40	5/16	1-1/4"	18	Hex. head screws	10 for mounting gear cover 30 for mounting cylinder heads
4	5/16	1-1/2"	18	Hex. head screws	For mounting cylinder head
4	5/16	1-3/4"	18	Hex. head screws	For mounting tappet inspection plates
4	3/8	3/4"	16	Hex. head screws	For mounting side rails to engine supports
6	3/8	1-1/4"	16	Hex. head screws	For mounting main bearing plate take-off end
1	3/8	2-1/4"	16	Hex. head screw	For mounting magneto lower hole
4	1/2	3/8"	13	Hex. head screws	For mounting engine supports to base
3	5/16	1"	18	Headless set screw	For mounting starter ring gear to flywheel
1	#0	3/4"		Taper pin	For governor yoke

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Quan.	Size	Length	Thread	Description	Function
9	1/16	1/2"		Cotter pins	1 for fuel pump plunger 8 for connecting rod bolts
1	3/32	1"		Cotter pin	For mounting oil pump gear nut
1	1/8	1"		Cotter pin	For relief valve spring
2	1/8	3/4"		Cotter pins	For door slips
3	1/8	3/4"		Cotter pins	1 for governor control rod 2 for choke rod

SECTION V

49. NAMES OF MANUFACTURERS.—

Wisconsin Motor Corporation, Milwaukee, Wisconsin..... (A)
 Ward Leonard Electric Company, Mount Vernon, New York... (B)
 Electric Autolite Company, Toledo, Ohio..... (C)
 R. W. Cramer Company, Centerbrook, Connecticut..... (D)
 Bendix Stromburg Company, South Bend, Indiana..... (E)
 United Specialties Company, Chicago, Illinois..... (F)
 J. B. T. Instrument Inc., New Haven, Connecticut..... (G)
 Globe Union Inc., Memphis, Tennessee..... (H)
 Guardian Electric Mfg. Company, Chicago, Illinois..... (I)
 Leece-Neville Company, Cleveland, Ohio..... (J)
 United Motors Service Corporation, Detroit, Michigan..... (K)
 American Pulley Company, Philadelphia, Pennsylvania..... (L)
 John R. Hollingsworth Corporation, Clifton Heights, Penna.... (M)
 Globe Union Inc., Milwaukee, Wisconsin..... (N)
 Novelty Electric Company, Philadelphia, Pennsylvania..... (O)
 Whitaker Battery Supply Company, Kansas City, Missouri.... (P)
 Westinghouse Electric and Mfg. Company, Philadelphia, Penna. (Q)
 Gates Rubber Company, Denver, Colorado..... (R)
 American Custom Built Motors, Chicago, Illinois..... (S)
 Automotive Specialty Corporation, Brooklyn, New York..... (T)
 Burlington Instrument Company, Burlington, Iowa..... (U)
 Nelson Muffler Corporation, Stoughton, Wisconsin..... (V)
 Shallcross Mfg. Company, Collingdale, Pennsylvania..... (W)
 Stewart-Warner Corporation, Chicago, Illinois..... (X)
 Vibration Eliminator Corporation, Astoria, L. I., New York.... (Y)
 Thomas P. Skelly Bolt Company, Philadelphia, Pennsylvania... (Z)
 Fairbanks-Morse Company, Chicago, Illinois..... (A-1)

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